DEVELOPING A STATE WATER PLAN

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1985

by

Ralph L. Seiler and others

United States Geological Survey

Prepared by the United States Geological Survey
in cooperation with the State of Utah

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CONVERSION FACTORS

Most values in this report are given in inch-pound units. Conversion factors to metric units are shown below.

Multiply	By	To obtain
Acre-foot	1233	Cubic meter
Foot	0.3048	Meter
Inch	25.40	Millimeter
Mile	1.609	Kilometer

Chemical concentration is given only in metric units--milligrams per liter. For concentrations less than 7,000 milligrams per liter, the numerical value is about the same as for concentrations in parts per million.

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INTRODUCTION

This is the twenty-second in a series of annual reports that describe ground-water conditions in Utah. Reports in the series, prepared cooperatively by the U.S. Geological Survey and the Utah Division of Water Resources, provide data to enable interested parties to keep abreast of changing ground-water conditions.

This report, like the others in the series, contains information on well construction, ground-water withdrawals from wells, water-level changes, and related changes in precipitation and streamflow. Supplementary data such as graphs showing chemical quality of water and maps showing ground-water level contours are included in reports of this series only for those years or areas for which applicable data are available and are important to a discussion of changing ground-water conditions.

The report includes individual discussions of selected major areas of ground-water development in the State for the calendar year 1984. Water-level fluctuations, however, are described for spring 1984 to spring 1985. Much of the data used in the report were collected by the Geological Survey in cooperation with the Division of Water Rights, Utah Department of Natural Resources.

The following reports dealing with ground water in the State were released or printed by the Geological Survey during 1984:

Ground-water conditions in Utah, spring of 1984, by Charles Avery and others, Utah Division of Water Resources Cooperative Investigations Report 24.

The ground-water system and possible effects of underground coal mining in the Trail Mountain area, central Utah, by G. C. Lines, U.S. Geological Survey Water-Supply Paper 2259 (in press).

General hydrology of the upper Colorado River Basin, by O. J. Taylor, J. W. Hood, and E. A. Zimmerman, U.S. Geological Survey Hydrologic Investigations Atlas 678 (in press).

Hydrologic reconnaissance of the Kolob, Alton, and Kaiparowits coal fields, south-central Utah, by Gerald G. Plantz, U.S. Geological Survey Hydrologic Investigations Atlas 678 (in press).

General hydrogeology of the aquifers of Mesozoic age, upper Colorado River basin--excluding the San Juan basin--Colorado, Utah, Wyoming, and Arizona, by G. W. Freethey, B. A. Kimball, D. E. Wilberg, and J. W. Hood, U.S. Geological Survey Hydrologic Investigations Altas 716 (in press).

Reconnaissance of geohydrology of the Moab-Monticello area, western Paradox basin, Grand and San Juan Counties, Utah, by J. E. Weir, Jr., E. Blair Maxfield, and I. M. Hart, U.S. Geological Survey Water-Resources Investigations Report 83-4098.

Maps showing distribution of dissolved solids and dominant chemical type in ground water, Basin and Range Province, Utah, by Thomas H. Thompson and Janet Nuter, U.S. Geological Survey Water-Resources Investigations Report 83-4122-C.

Regional hydrology of the Dolores River basin, eastern Paradox basin, Colorado and Utah, by J. E. Weir, E. Blair Maxfield, and E. A. Zimmerman, Water-Resources Investigations Report 83-4217.

Regional hydrology of the Blanding-Durango area, southern Paradox basin, Utah and Colorado, by M. S. Whitfield, Jr., William Thordarson, W. J. Oatfield, E. A. Zimmerman, and B. F. Rueger, U.S. Geological Survey Water-Resources Investigations Report 83-4218.

Hydrology of Area 57, Northern Great Plains and Rocky Mountain Coal Provinces, Utah and Colorado, by Don Price and others, U.S. Geological Survey Water-Resources Investigations Report 84-68

Selected drill-stem test data for the upper Colorado River Basin, by Ralph W. Teller and Daniel T. Chafin, U.S. Geological Survey Water-Resources Investigations Report 84-4146.

Infiltration to the Navajo Sandstone, lower Dirty Devil River basin, Utah, with emphasis on techniques used in its determination, by T. W. Danielson and J. W. Hood, U.S. Geological Survey Water-Resources Investigations Report 84-4154.

Hydrologic Map of the Price 30 X 60-minute quadrangle, Utah, H. F. McCormack, K. L. Lindskov, and B. L. Stolp, U.S. Geological Survey Water-Resources Investigations Report 84-4227 (in press).

Ground-water resources of northern Utah Valley, Utah, by D. W. Clark and C. L. Appel, Utah Department of Natural Resources Technical Publication 80 (in press).

Ground-water conditions in the Kaiparowitz Plateau area, Utah and Arizona, with emphasis on the Navajo Sandstone, by Paul J. Blanchard, Utah Department of Natural Resources Technical Publication 81 (in press).

Hydrogeology of northwestern Utah and adjacent parts of Idaho and Nevada, by J. S. Gates in 1984 Utah Geological Association Guidebook.

Use of laboratory-determined aquifers coefficients, by J. W. Hood, Abstract, in Irrigation and Drainage Division Conference Proceedings, American Society of Civil Engineers.

UTAH'S GROUND-WATER RESERVOIRS

Small quantities of ground water can be obtained from wells throughout much of Utah, but large supplies that are of suitable chemical quality for irrigation, public supply, or industrial use generally can be obtained only in specific areas. The major areas of ground-water development discussed in this report are shown in figure 1 and named in table 1. Relatively few wells outside of these areas yield large supplies of water of good chemical quality for the uses listed above, although some of the basins in western Utah and many areas in eastern Utah have not been explored sufficiently to determine their potential for ground-water development.

About 2 percent of the wells in Utah obtain water from consolidated rocks. The consolidated rocks that yield the most water are lava flows, such as basalt, which contain interconnected vesicular openings or fractures; limestone, which contain fractures or other openings enlarged by solution; and sandstone, which contains open fractures. Most of the wells that tap consolidated rocks are in the eastern and southern parts of the State in areas where water supplies cannot be obtained readily from unconsolidated rocks.

About 98 percent of the wells in Utah draw water from unconsolidated rocks. These rocks may consist of boulders, gravel, sand, silt, or clay, or a mixture of some or all of these materials. Wells obtain the largest yields from the coarser materials that are sorted into deposits of uniform grain size. Most wells that tap unconsolidated rocks are in large intermountain basins, which have been partly filled with rock material eroded from the adjacent mountains.

SUMMARY OF CONDITIONS

The estimated total withdrawal of water from wells in Utah during 1984 was about 614,000 acre-feet, which is about 14,000 acre-feet more than during 1983 and about 193,000 acre-feet less than the average annual withdrawal for 1974-83 (table 2). The increase in withdrawal primarily was due to an increase in withdrawal for industry and public supply. Withdrawal for public supply was 138,000 acre-feet, (table 2) which is 9,000 acre-feet more than during 1983. Withdrawal for industry was 86,000 acre-feet, which is 8,000 acre-feet more than in 1983. Total withdrawal for irrigation during 1984 was about 329,000 acre-feet, which is 5,000 acre-feet less than reported for 1983. Withdrawal for domestic and stock use was 60,000 acre-feet, which is 1,000 acre-feet more than during 1983.

The quantity of water withdrawn from wells is related to local climatic conditions. Precipitation during 1984 was above average throughout most of Utah (National Oceanic and Atmospheric Administration, 1985). Of the 33 weather stations for which graphs of cumulative departure from average annual precipitation are included in this report, only 5 stations recorded below the average annual amount. 1984 was the third consecutive year in which precipitation was generally above average in Utah.

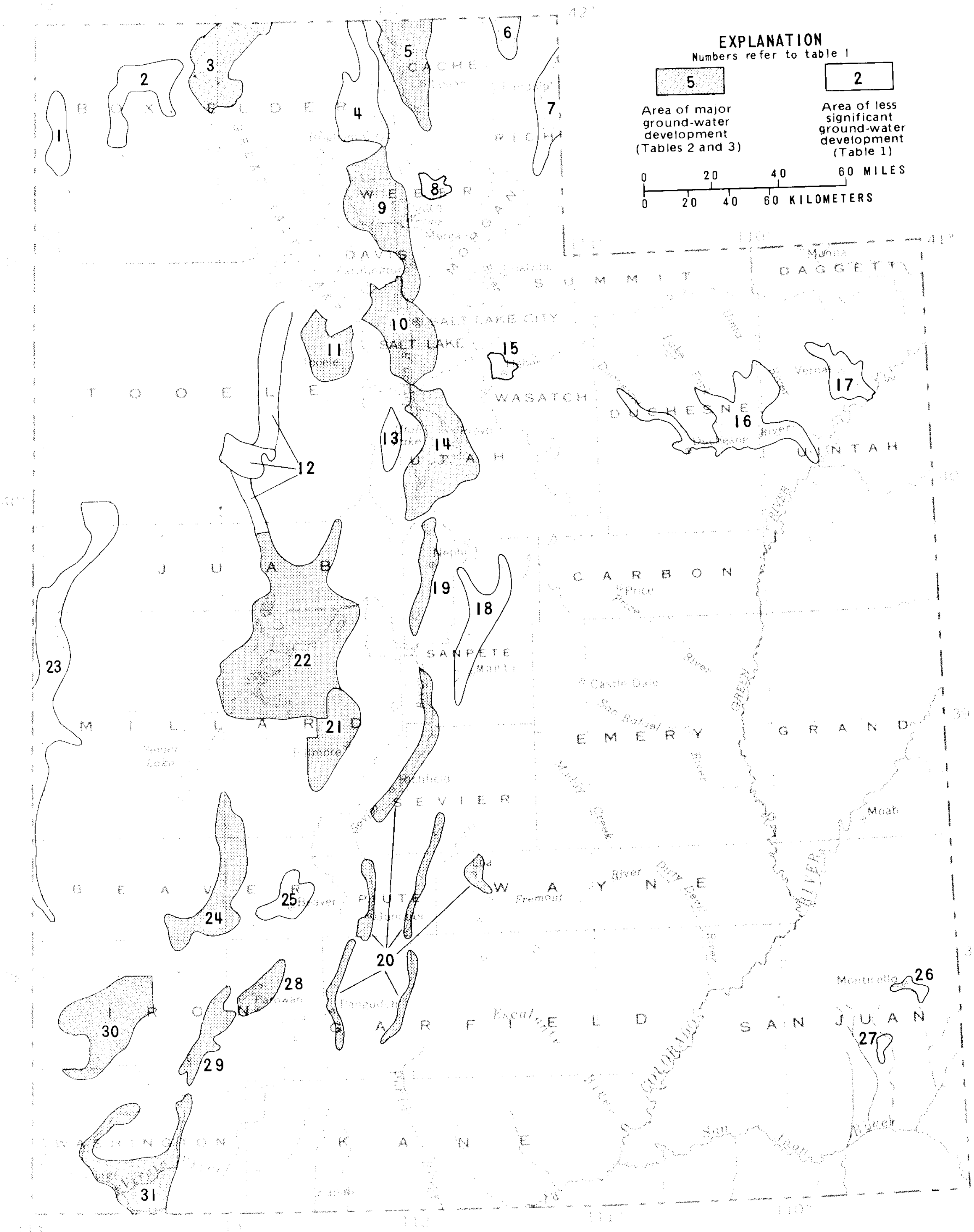

Figure 1.--Areas of ground-water development specifically referred to in this report.

Table 1.—Areas of ground-water development in Utah specifically referred to in this report

Number in figure 1	Area	Principal type of water-bearing rocks
1	Grouse Creek Valley	Unconsolidated
2	Park Valley	Do.
3	Curlew Valley	Unconsolidated and consolidated
4	Malad-lower Bear River valley	Unconsolidated
5	Cache Valley	Do.
6	Bear Lake valley	Do.
7	Upper Bear River valley	Do.
8	Ogden Valley	Do.
9	East Shore area	Do.
10	Salt Lake Valley	Do.
11	Tooele Valley	Do.
12	Dugway area	Do.
	Skull Valley	Do.
	Old River Bed	Do.
13	Cedar Valley	Do.
14	Utah and Goshen Valleys	Do.
15	Heber Valley	Do.
16	Duchesne River area	Unconsolidated and consolidated
17	Vernal area	Do.
18	Sanpete Valley	Unconsolidated
19	Juab Valley	Do.
20	Central Sevier Valley	Do.
	Upper Sevier Valleys	Do.
	Upper Fremont River valley	Unconsolidated and consolidated
21	Pahvant Valley	Do.
22	Sevier Desert	Unconsolidated
23	Snake Valley	Do.
24	Milford area	Do.
25	Beaver Valley	Do.
26	Monticello area	Consolidated
27	Blanding area	Do.
28	Parowan Valley	Unconsolidated and consolidated
29	Cedar City Valley	Unconsolidated
30	Beryl-Enterprise area	Do.
31	Central Virgin River area	Unconsolidated and consolidated

Table 2.--Well contruction and withdrawal of water from wells in Utah

Number of wells contructed in 1984.--Data provided by Utah Department of Natural Resources, Division of Water Rights, Includes deepened and replacement wells.

Diameter of 6 inches or more.--Constructed for irrigation, industry, or public supply.

Estimated withdrawals from wells.--

1983 total: From Avery and others (1984, table 2), includes some unpublished revisions.

1974-83 average annual: Calculated from previous reports of this series and also includes some previously unpublished revisions.

Area	Number in figure 1	Number of wells constructed in 1984: Total	Number of wells constructed in 1984: Diameter of 6 inches or more	Estimated withdrawals from wells (acre-feet), 1984: Irrigation	1984: Industry	1984: Public supply	1984: Domestic and stock	1984: Total (rounded)	1983 total	1974-83 average annual
Curlew Valley	3	1	0	19,500	0	20	50	20,000	18,000	27,000
Cache Valley	5	29	4	9,500	6,800	3,200	1,800	21,000	20.000	27,000
East Shore area	9	16	1	[1]11,800	9,100	27,900	-	49,000	43,000	41,000
Salt Lake Valley	10	46	8	1,500	[2]19,200	56,400	25,300	102,000	[3]110,000	119,000
Tooele Valley	11	13	3	[1]17,700	1,150	4,300	330	23,000	22,000	28,000
Utah and Goshen Valleys	14	28	4	31,700	10,500	15.400	19.900	78,000	74,000	100,000
Juab Valley	19	1	1	4,500	50	1,000	300	6,000	6,000	21,000
Sevier Desert	22	22	2	7,100	1,800	980	300	10,000	8,000	28,000
Upper and central Sevier Valleys and upper Fremont River valley	20	26	1	11,800	200	3,000	5,000	20.000	21,000	24,000
Pahvant Valley	21	12	0	31,800	100	380	300	33,000	42,000	85,000
Cedar City Valley	29	2	0	17,300	900	1,900	400	20.000	21,000	32.000
Parowan Valley	28	12	2	[4]21,000	300	100	200	22,000	22,000	29,000
Escalante Valley										
Milford area	24	2	1	31,000	0	900	250	32.000	39.000	59,000
Beryl-Enterprise area	30	12	7	65,900	28,300	390	750	95,000	86,000	84,000
Central Virgin River area[5]	31	5	0	11,000	-	[6]7,600	250	19,000	16,000	19,000
Other areas[7]		238	21	35,900	8,000	14,900	5,000	64,000	52,000	84,000
Totals (rounded)		465	55	329,000	86,000	138,000	60.000	614,000	600,000	807,000

[1]Includes some domestic and stock use.
[2]Includes some use for air conditioning which is reinjected into the aquifer.
[3]Previously unreported revision.
[4]Includes some use for stock.
[5]Prior to 1984 included under "Other Areas"
[6]Includes some industrial use.
[7]Withdrawals are estimated minimum amounts.

The above average precipitation in the last three years has resulted in abundant surface-water supplies, and this has resulted in the reduction of ground-water withdrawals to only about 75 percent of the average annual amount during the previous ten years. Withdrawals for 1984 were less than the 1974-83 average annual withdrawals in 13 of the 16 areas specifically referred to in this report. The above average precipitation throughout most of Utah during 1984 has resulted in continued increased recharge to the ground-water reservoirs. The combination of these two effects of the above average precipitation resulted in rises of ground-water levels, which in some areas were quite large, throughout most of the State from spring of 1984 to spring of 1985. Water levels in some valleys have returned to predevelopment levels and some wells began to flow that have never flowed before. Continued withdrawal for irrigation and increased withdrawal for industry, however, resulted in a decline of water levels in most of the Beryl-Enterprise area of Escalante Valley.

The total number of wells drilled during 1984 (table 2), as indicated by well-drillers' reports filed with the Utah Division of Water Rights, was about 23 percent more than reported for 1983. The number of large-diameter wells mostly constructed for public supply, irrigation, and industrial use was the same as reported for 1983.

The larger ground-water basins and those experiencing most of the ground-water development in Utah are shown on figure 1. Table 2 gives information about the number of wells constructed, withdrawals of water from wells for principal uses, and total withdrawals during 1984 for the major areas of ground-water development. For comparison, total withdrawals during 1983 and average annual withdrawals for 1974-83 also are shown in table 2. Table 3 shows the annual withdrawals from the major areas of ground-water development for 1974-83.

Table 3.--Total annual withdrawal of water from wells in major areas of ground-water development in Utah, 1974-83
[From previous reports of this series.]

Area	Number in figure 1	Thousands of acre-feet									
		1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Curlew Valley	3	22	21	27	31	27	29	30	40	26	18
Cache Valley	5	24	25	27	32	26	28	25	33	26	20
East Shore area	9	47	38	37	48	36	46	45	36	38	43
Salt Lake Valley[1]	10	118	116	116	113	120	125	129	127	115	110
Tooele Valley	11	33	29	30	28	30	30	27	30	26	22
Utah and Goshen Valleys	14	106	98	107	118	104	107	94	101	86	74
Juab Valley	19	31	25	29	29	19	21	15	21	16	6
Sevier Desert	22	26	26	34	50	40	45	13	18	16	8
Upper and central Sevier Valleys and upper Fremont River valley	20	20	24	25	26	26	24	24	25	28	21
Pahvant Valley	21	101	98	95	117	88	86	75	80	69	42
Cedar City Valley	29	42	28	37	40	31	32	28	29	28	21
Parowan Valley	28	31	28	34	33	29	30	28	27	25	22
Escalante Valley											
Milford area	24	70	60	65	65	58	49	61	69	55	39
Beryl-Enterprise area	30	93	85	79	81	71	79	71	93	99	86
Central Virgin River area[2]	31	13	13	17	18	20	20	20	22	27	16
Other areas		88	66	89	108	92	92	70	83	100	52
Totals		865	780	848	937	817	834	755	833	780	600

[1]Includes previously unpublished revisions
[2]Prior to 1984 included under "Other areas"

MAJOR AREAS OF GROUND-WATER DEVELOPMENT

CURLEW VALLEY

by L. R. Herbert

Withdrawal of water from wells in Curlew valley in 1984 was about 20,000 acre-feet, an increase of 2,000 acre-feet from the amount reported for 1983, and 7,000 acre-feet less than the average annual withdrawal for 1974-83 (table 2). The increased was due to increase withdrawal for irrigation.

Water levels in all observation wells in Curlew valley rose from March 1984 to March 1985 (fig.2) due to recharge from above average precipitation. The maximun observed rise was 10.6 feet in a well west of Snowville.

The relation of water levels in two selected observation wells to cumulative departure from average annual precipitation at Snowville and annual withdrawals from wells is shown in figure 3. Although the water level in well (B-14-9)7bbb-1 declined from 1955 to 1982 the water level is now about equal to the 1965 water level. Precipitation at Snowville in 1984 was 12.58 inches, 0.54 inches above the average annual precipitation for 1941-84.

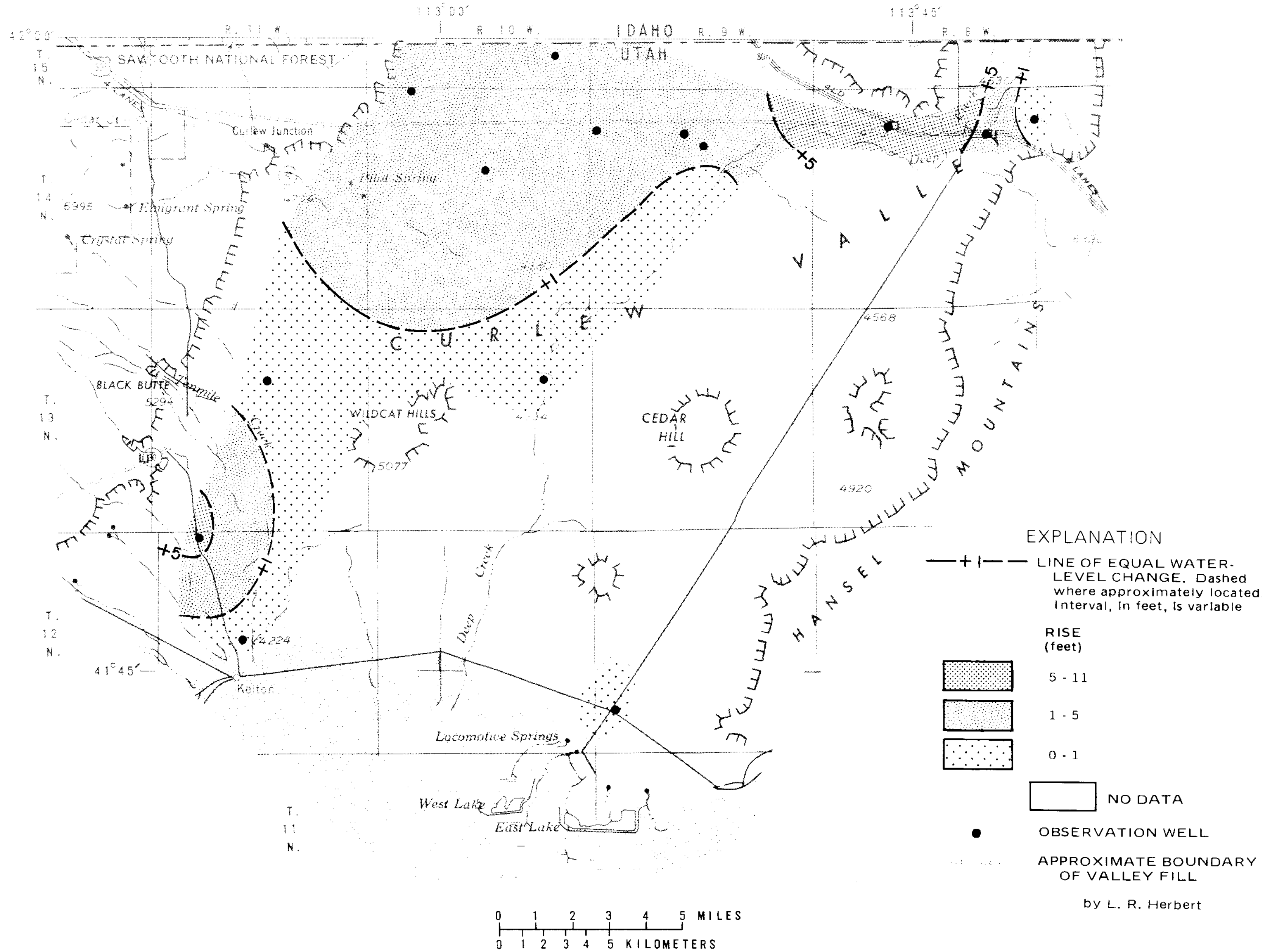

Figure 2.—Map of Curlew Valley showing change of water levels from March 1984 to March 1985.

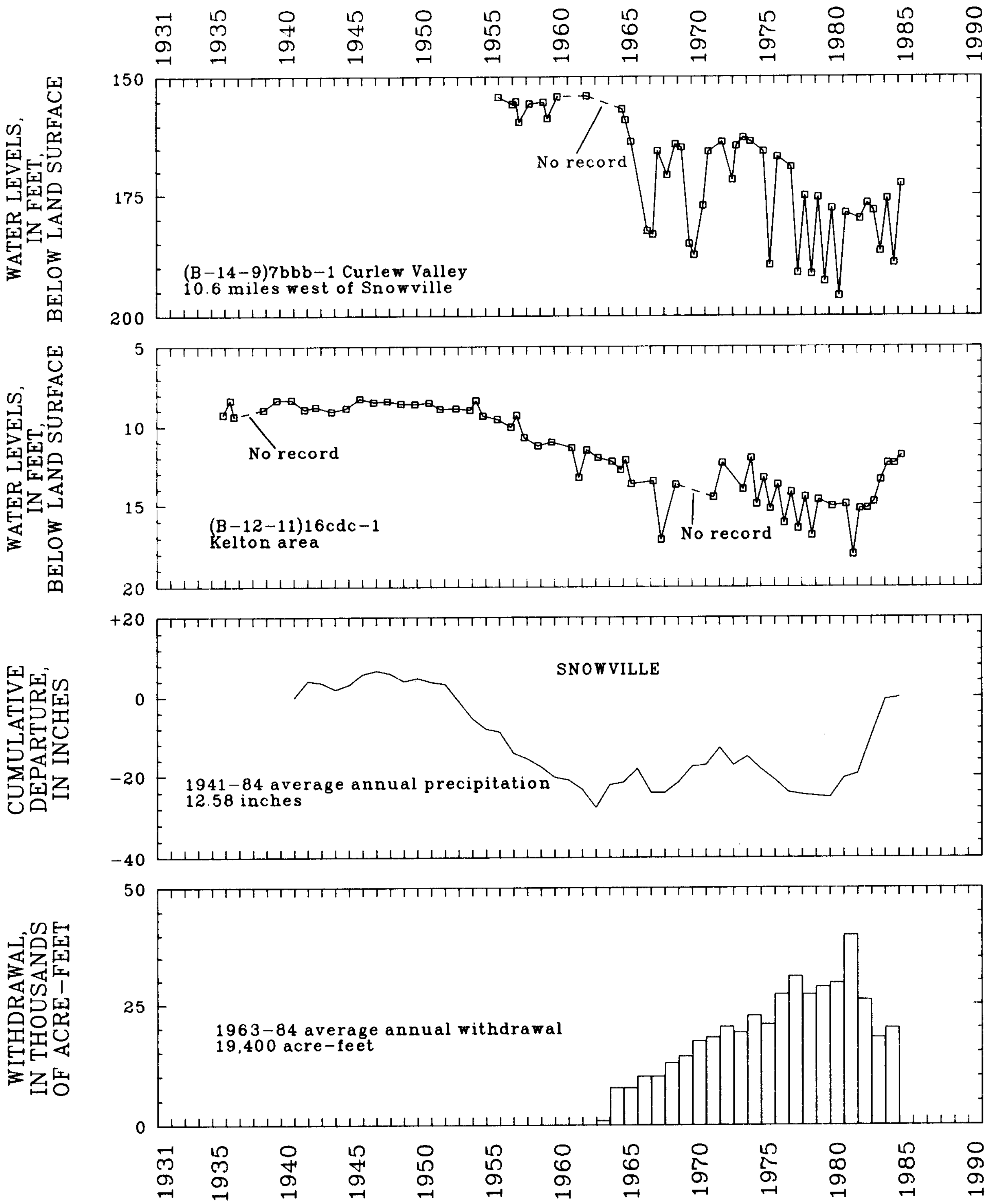

Figure 3.—Relation of water levels in selected wells in Curlew Valley to cumulative departure from the average annual precipitation at Snowville and to annual withdrawals from wells.

CACHE VALLEY

By Don A. Bischoff

Approximately 21,000 acre-feet of water was withdrawn from wells in Cache Valley in 1984. This was 1,000 acre-feet more than the amount withdrawn in 1983 and 6,000 acre-feet less than the average annual withdrawal for the period 1974-83 (table 2). The increased withdrawal from 1983 was mainly due to increased withdrawal for public supply. Discharge of the Logan River during 1984 was 309,000 acre-feet which is 47,000 more than in 1983 and 167 percent of the 1941-84 average annual discharge.

Water levels from March 1984 to March 1985 rose up to four feet on the north and south ends of the valley and declined less than one foot in the central part of the valley (figure 4). The largest decline, less than two feet, was measured near Richmond.

The long-term trend of the water levels in well (A-12-1)29cab-1, the annual discharge of the Logan River near Logan, and the cumulative departure from the annual precipitation at Logan, Utah State University, and annual withdrawals from wells are shown in figure 5. Annual precipitation of 23.55 inches in 1984 was 4.78 inches above the 1941-84 average. The above-average precipitation resulted in above average streamflow and lower than average ground-water withdrawals in most of the valley.

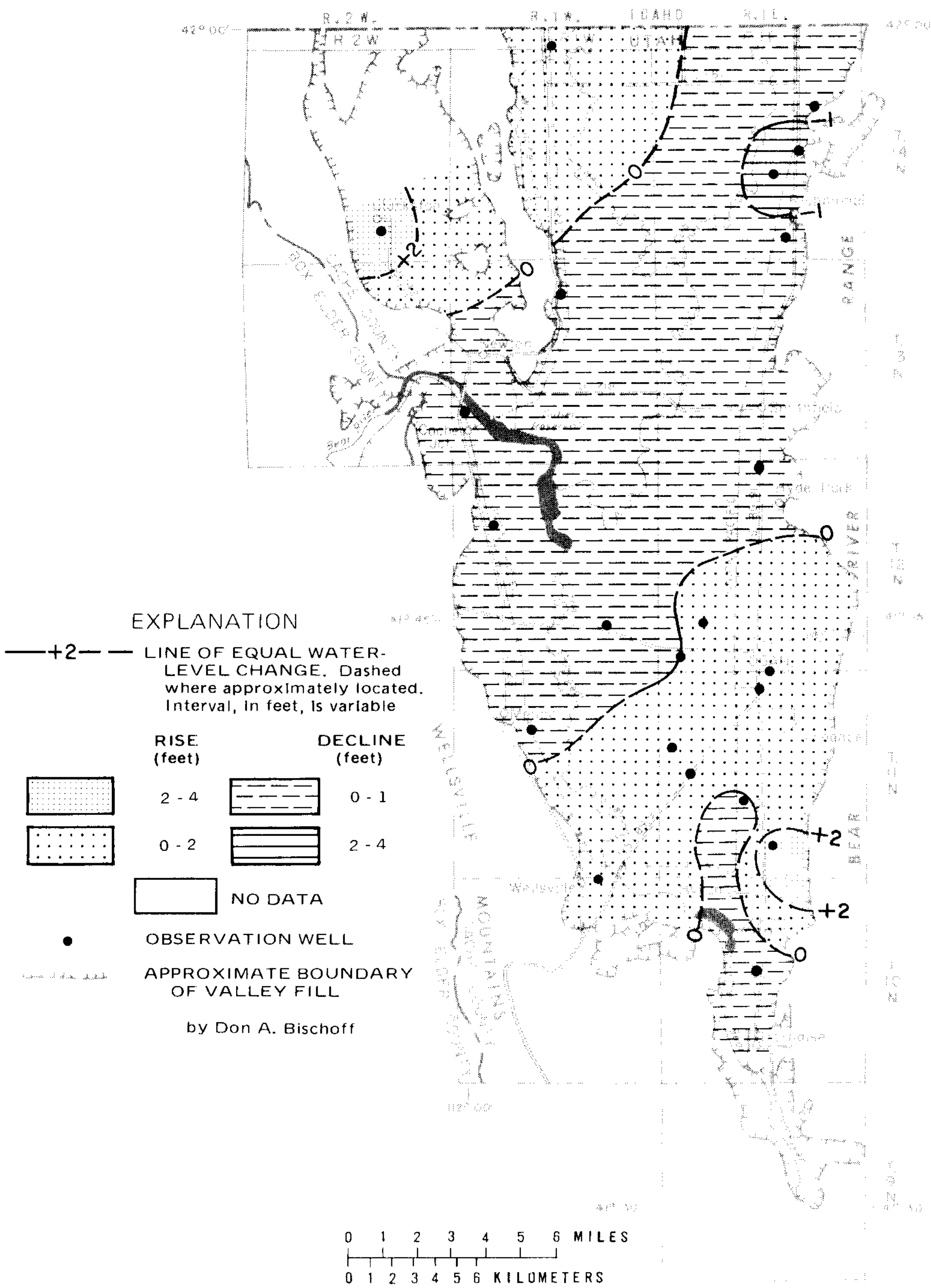

Figure 4.—Map of Cache Valley showing change of water levels from March 1984 to March 1985.

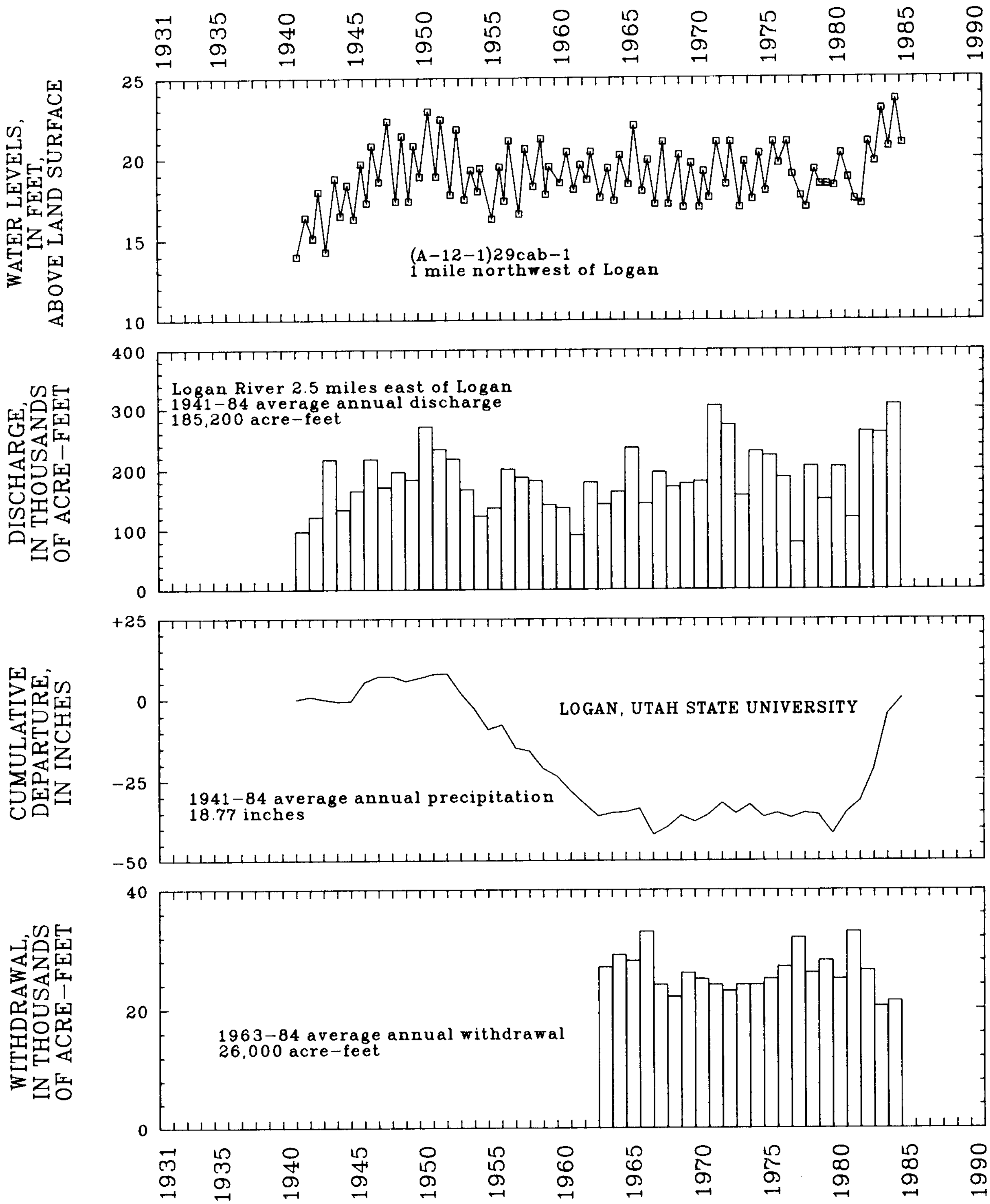

Figure 5.—Relation of water levels in well (A-12-1)29cab-1 in Cache Valley to discharge of the Logan River near Logan, to cumulative departure from the average annual precipitation at Logan, Utah State University, and to annual withdrawals from wells.

EAST SHORE AREA

By David W. Clark

Withdrawal of water from wells in the East Shore area in 1984 was about 49,000 acre-feet, about 6,000 acre-feet more than the withdrawal in 1983, and 8,000 acre-feet more than the average annual withdrawal for 1974-83 (table 2). The increased withdrawal was primarily due to increases for public supply.

Water levels rose in most of the East Shore area from March 1984 to March 1985 (fig. 6) due to recharge from continued above average precipitation. Rises of up to 3 feet occurred in some of the area with rises of up to 5 feet occurring in the area near Ogden. Declines of up to 5 feet occurred in some of the recharge areas where large rises were observed in the spring of 1984. The declines in these recharge areas are probably a result of the water levels stabilizing at near normal levels after the near record high levels observed the preceding year.

The long-term relation of water levels in selected observation wells to precipitation at the Ogden Pioneer Powerhouse and total ground-water withdrawal from wells is shown in figure 7. The 1984 precipitation at the Ogden Pioneer Powerhouse was 24.39 inches or 2.60 inches above the average annual precipitation for 1937-84 at that site. The declining trend of the water levels in wells (B-4-1)30bba-1, (B-5-2)33ddc-1, and (B-6-2)26ada-1 since about 1950 reflect the large-scale withdrawal of ground-water for public supply and industry.

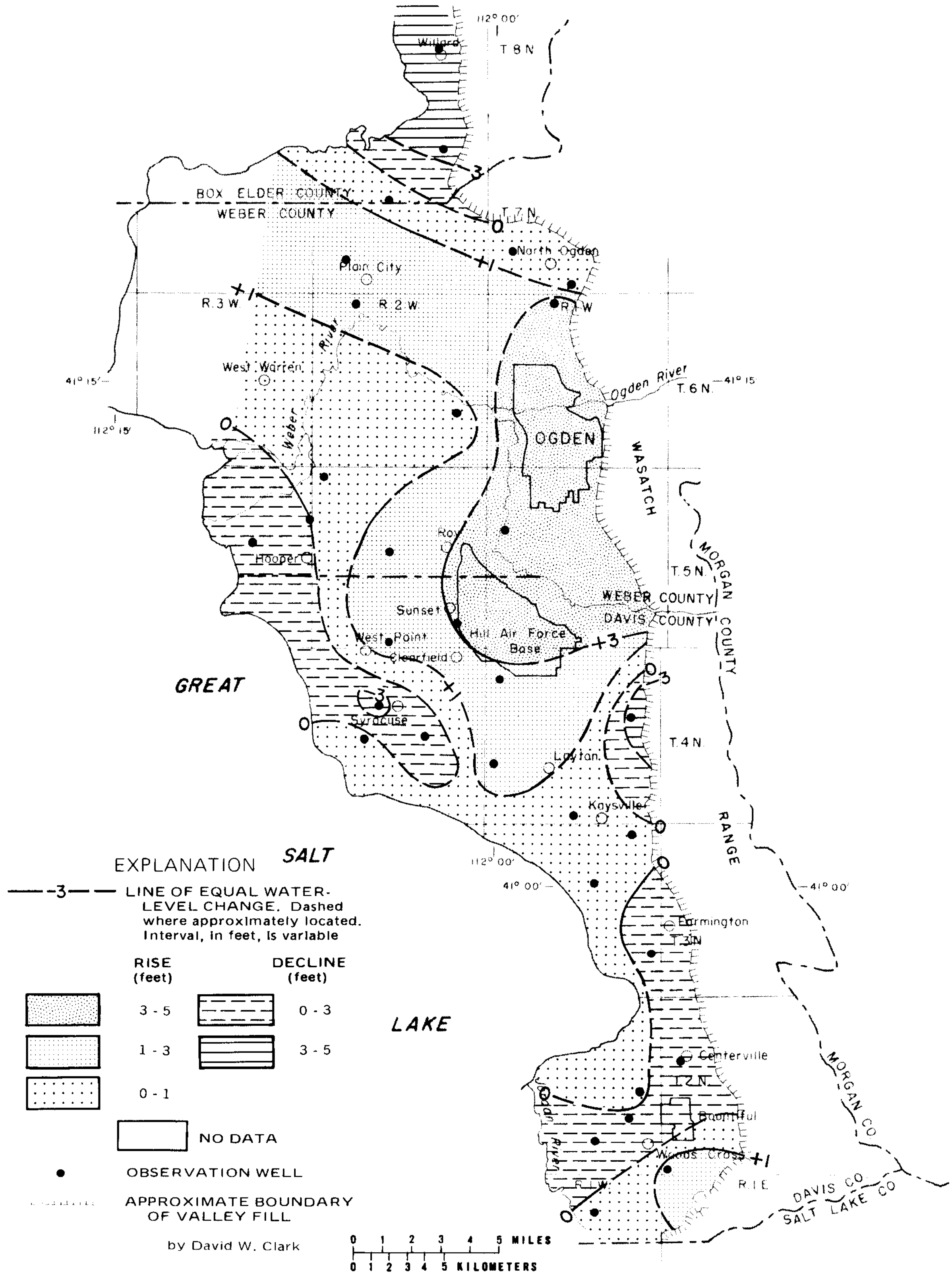

Figure 6.—Map of the East Shore area showing change of water levels from March 1984 to March 1985.

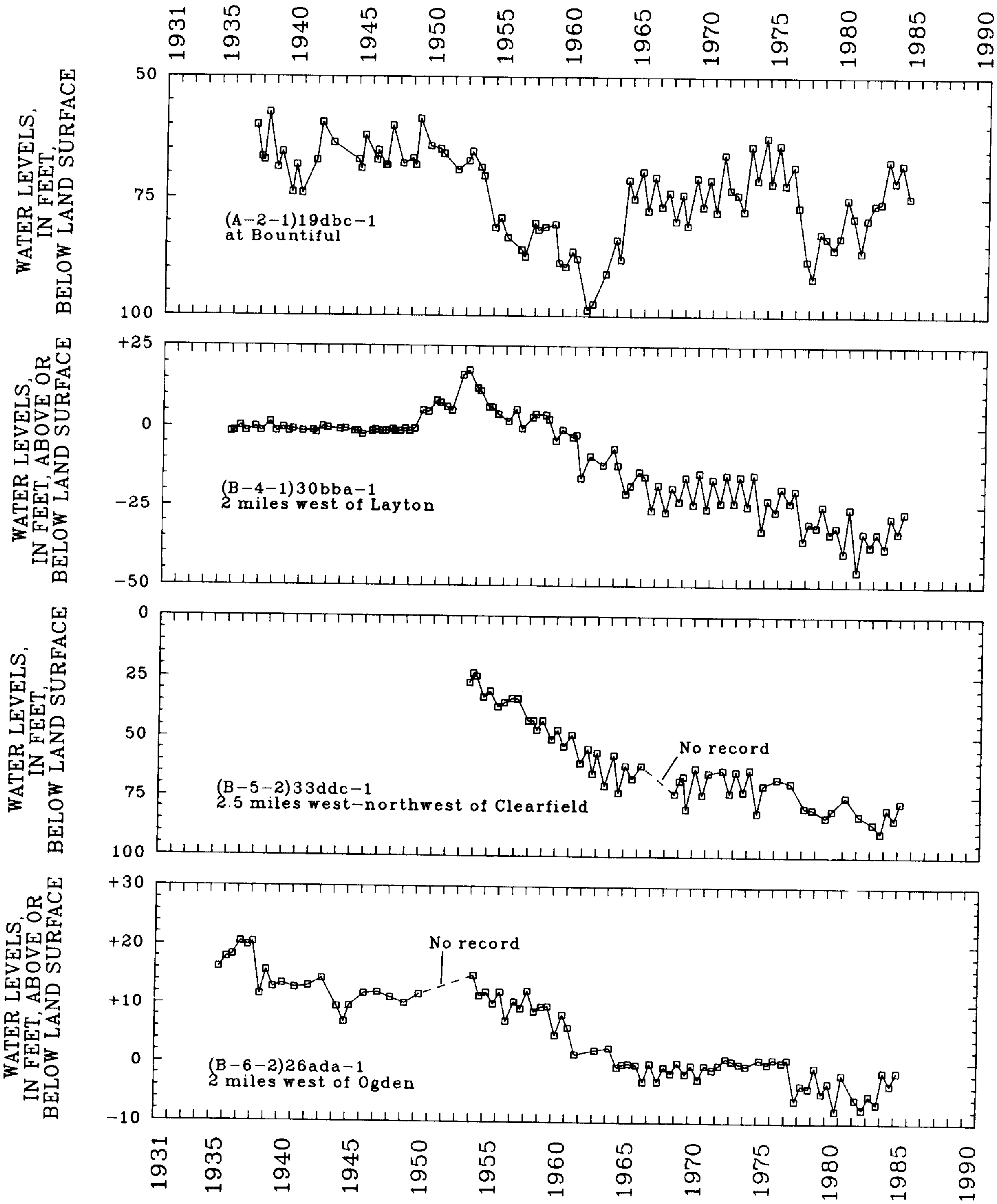

Figure 7.—Relation of water levels in selected wells in the East Shore area to cumulative departure from the average annual precipitation at Ogden Pioneer Powerhouse and to annual withdrawals from wells.

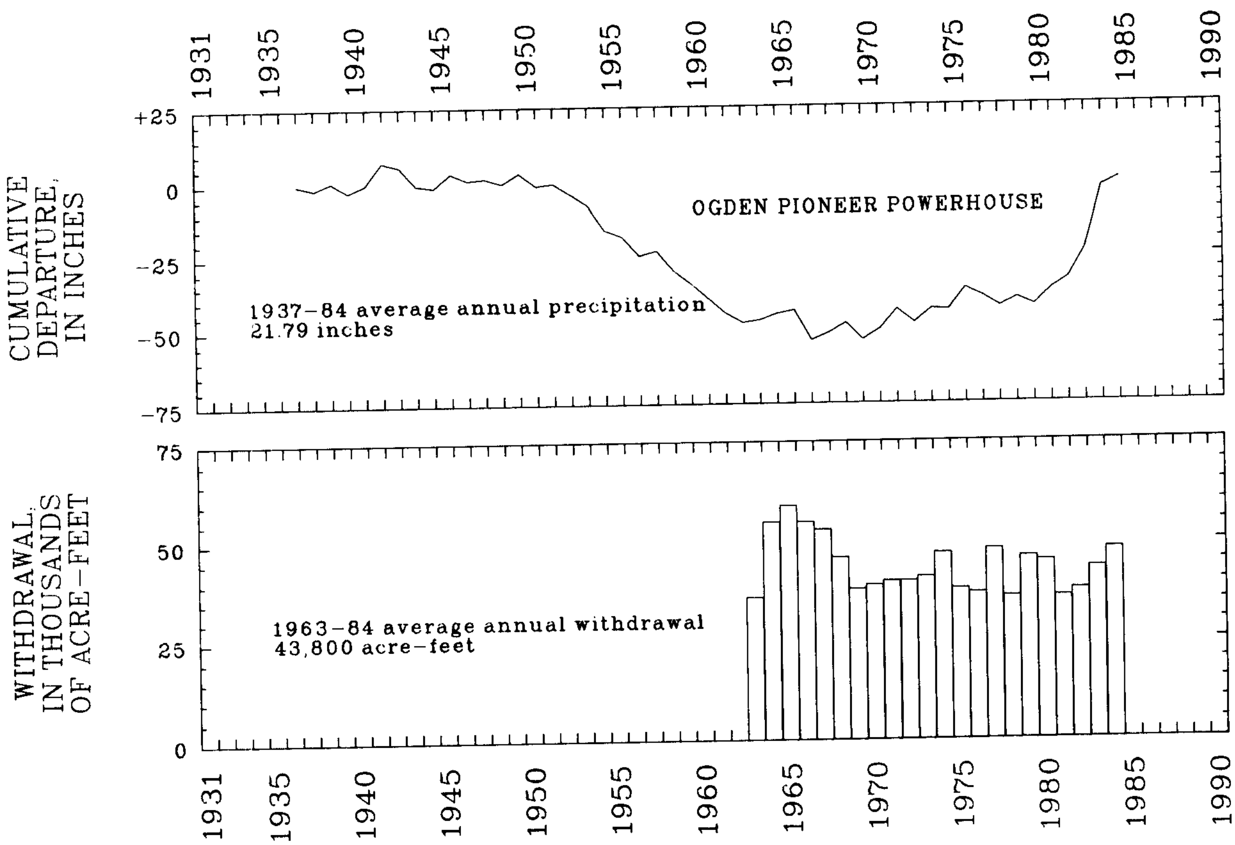

Figure 7.—Continued

SALT LAKE VALLEY

By Ralph L. Seiler

Withdrawal of water from wells in the Salt Lake Valley in 1984 was about 102,000 acre-feet, or about 8,000 acre-feet less than in 1983 and 17,000 less than the average annual withdrawal for 1974-83 (table 2). Withdrawal for public supply was 56,400, or about 1,700 acre-feet more than the revised value for 1983. Industrial use declined 9,500 acre-feet from 1983, primarily because of reduced withdrawals for copper mining.

Total ground-water withdrawals for Salt Lake Valley as published in this series of reports were revised during a recently completed investigation of the ground water resources of Salt Lake Valley. The previously published value and the revised values are summarized below:

Year	Previously-published total	Revised total
1969	109,000	106,000
1970	109,000	105,000
1971	116,000	107,000
1972	124,000	118,000
1973	129,000	122,000
1974	130,000	118,000
1975	122,000	116,000
1976	124,000	116,000
1977	119,000	113,000
1978	127,000	120,000
1979	136,000	125,000
1980	128,000	129,000
1981	136,000	127,000
1982	125,000	115,000
1983	117,000	110,000

The withdrawal for domestic and stock use was revised based on a field survey done as part of the Salt Lake Valley investigation and was prorated from 1982 back to 1969. Estimates used in this annual series of reports were as much as 6,700 acre-feet per year higher than the value obtained by pro-rating the 1982 estimate value back to 1969.

In the annual reports for some years discharge of springs (as much as 6,000 acre-feet per year) was inadvertently included as a withdrawal under public supply. Some arithmetic errors were also found in, and some withdrawals were omitted from, earlier estimates and were corrected.

Water levels in the principal aquifer rose in most parts of the Salt Lake Valley from February 1984 to February 1985 (fig. 8). The average net change over the entire valley was a rise of about 2.5 feet. The rises were less than 2 feet in 49 percent of the valley, from 2 to 9 feet in about 36 percent of the valley and greater than 9 feet in small areas southeast of Herriman and along the Oquirrh Mountain front. The largest rise, just over 12 feet, was measured in a well northeast of Lark. Water levels declined in about 13 percent of the valley. Declines of less than 2 feet were measured in small areas near the southernmost end of the valley, southwest of Sandy and in a large area between Murray, Holladay, Kearns and Salt Lake City. The largest decline, 2.2 feet, was measured in a well near Salt Lake City.

The relation of water levels in selected observation wells in the principal aquifer to precipitation,, total annual and public-supply withdrawals from wells, and population are shown in figures 9 and 10. Water levels rose from February 1984 to February 1985 in all wells for which hydrographs are shown except (D-1-1)7abd-6 which showed a slight decline. Precipitation at Silver Lake

Brighton was 50.97 inches, 8.00 inches above the average annual precipitation for 1931-84 and at the Salt Lake City WSO (International Airport) was 21.55 inches, 6.31 inches above the average annual precipitation for 1931-1984.

Water levels in selected observation wells in the shallow water-table aquifer in the northwest part of the valley are shown in figure 11. Water levels in February and March 1985 were nearly equal to water levels during the same period in 1984. The highest water levels in these wells usually occur in February or March when recharge occurs from snowmelt on the valley floor.

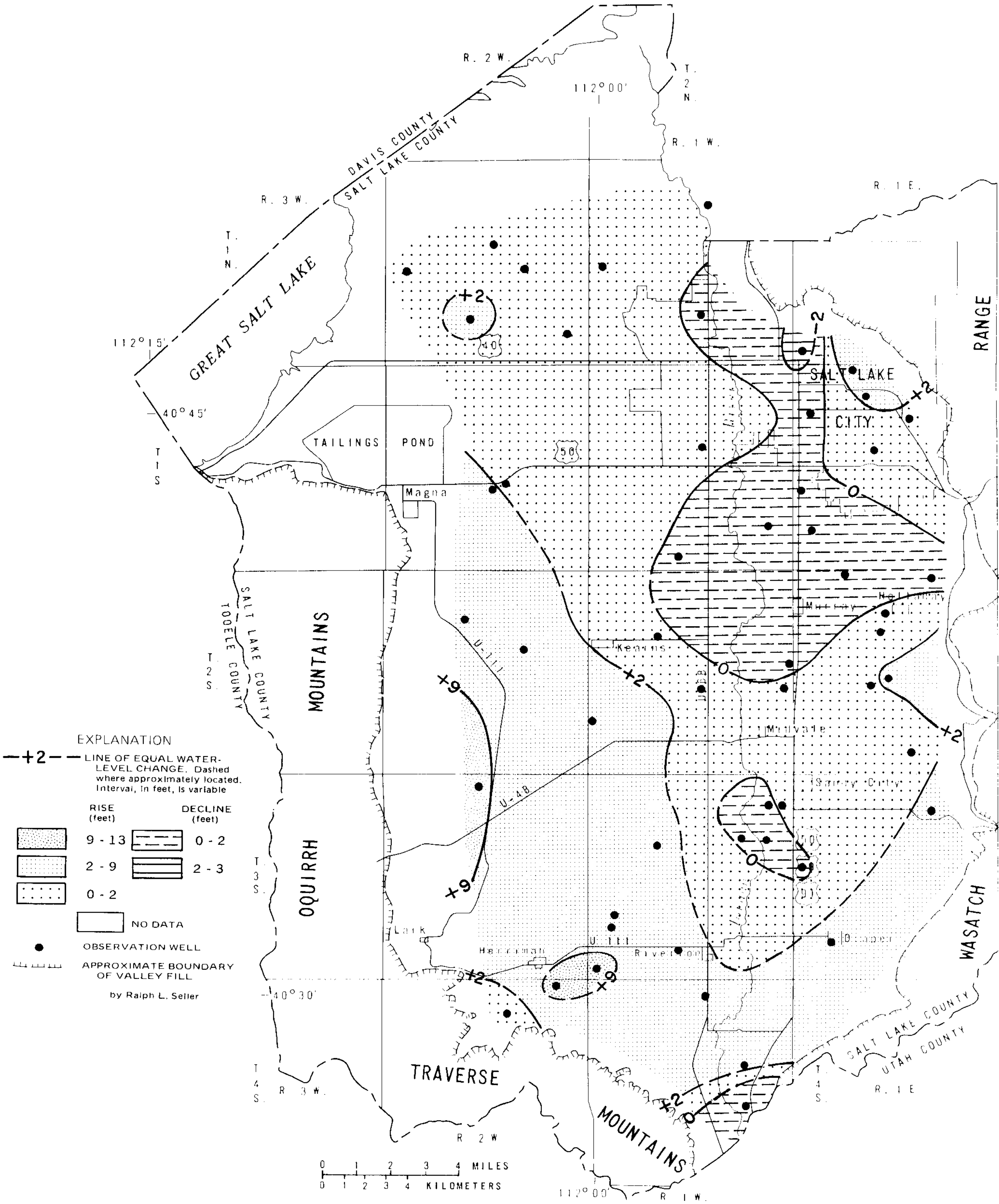

Figure 8.—Map of the Salt Lake Valley showing change of water levels in the principal aquifer from February 1984 to February 1985.

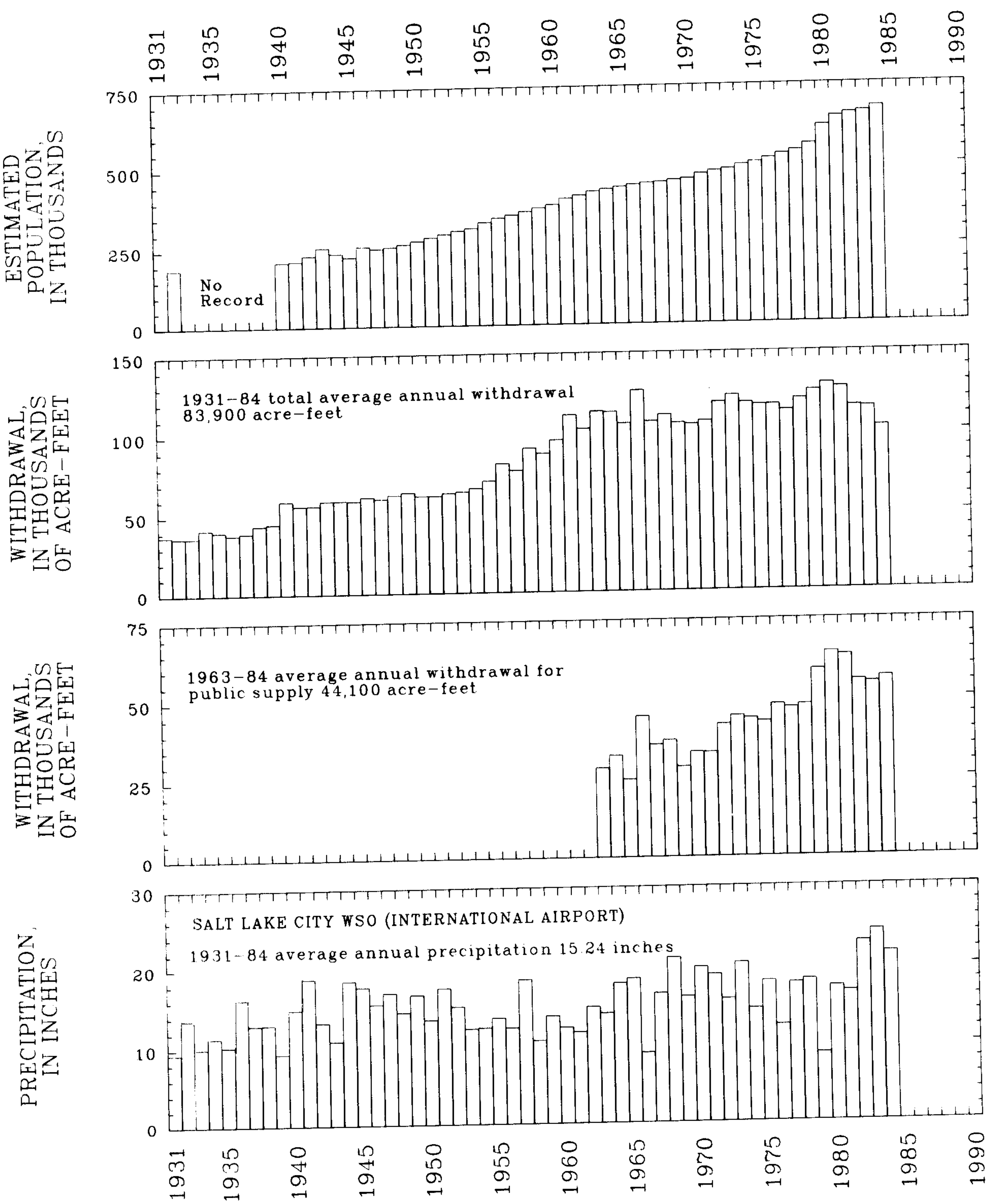

Figure 9.—Estimated population of Salt Lake County, total annual withdrawals from wells, annual withdrawal for public supply, and average annual precipitation at Salt Lake City WSO (International Airport).

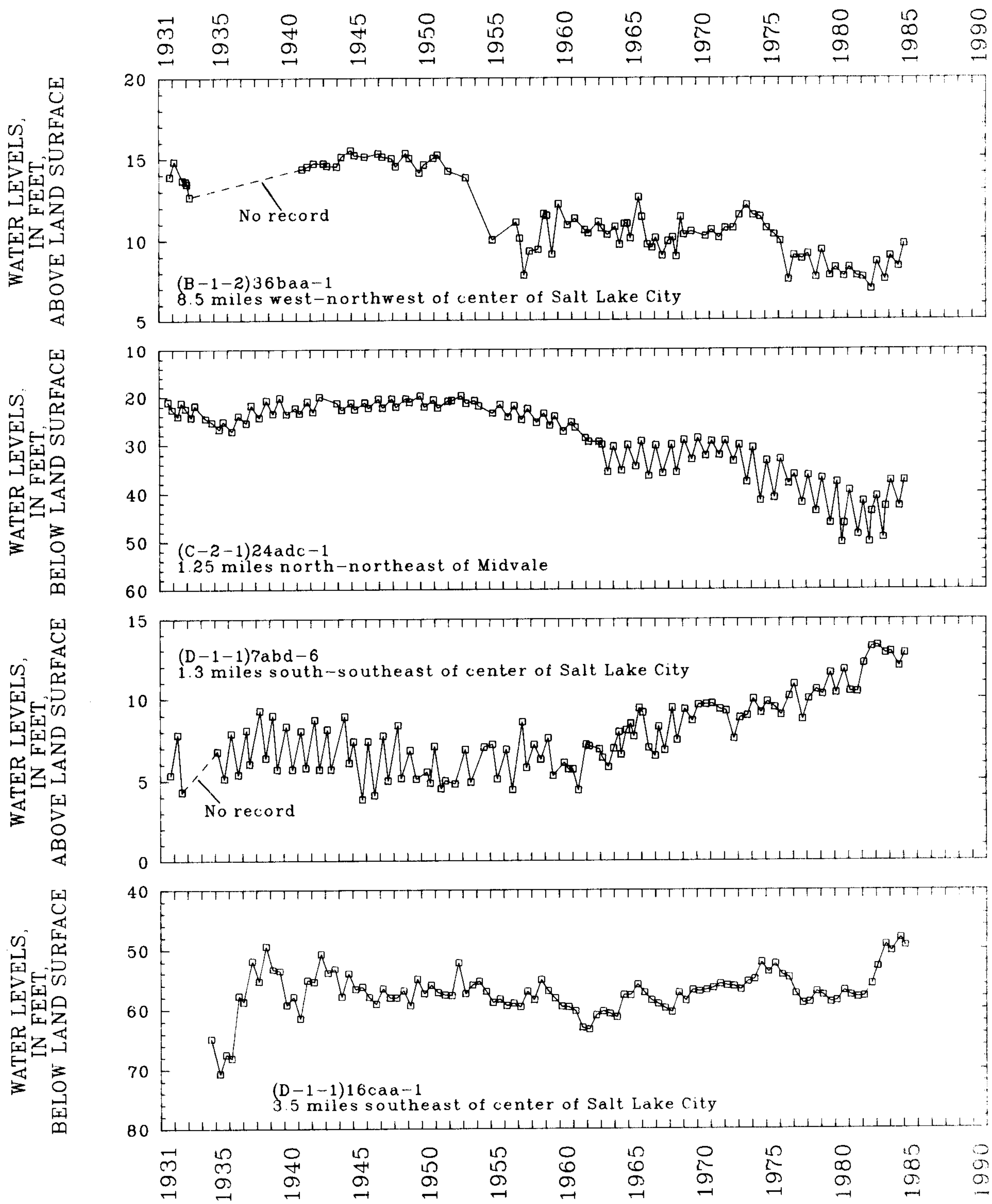

Figure 10.—Relation of water levels in the principal aquifer in selected wells in Salt Lake Valley to cumulative departure from the average annual precipitation at Silver Lake Brighton.

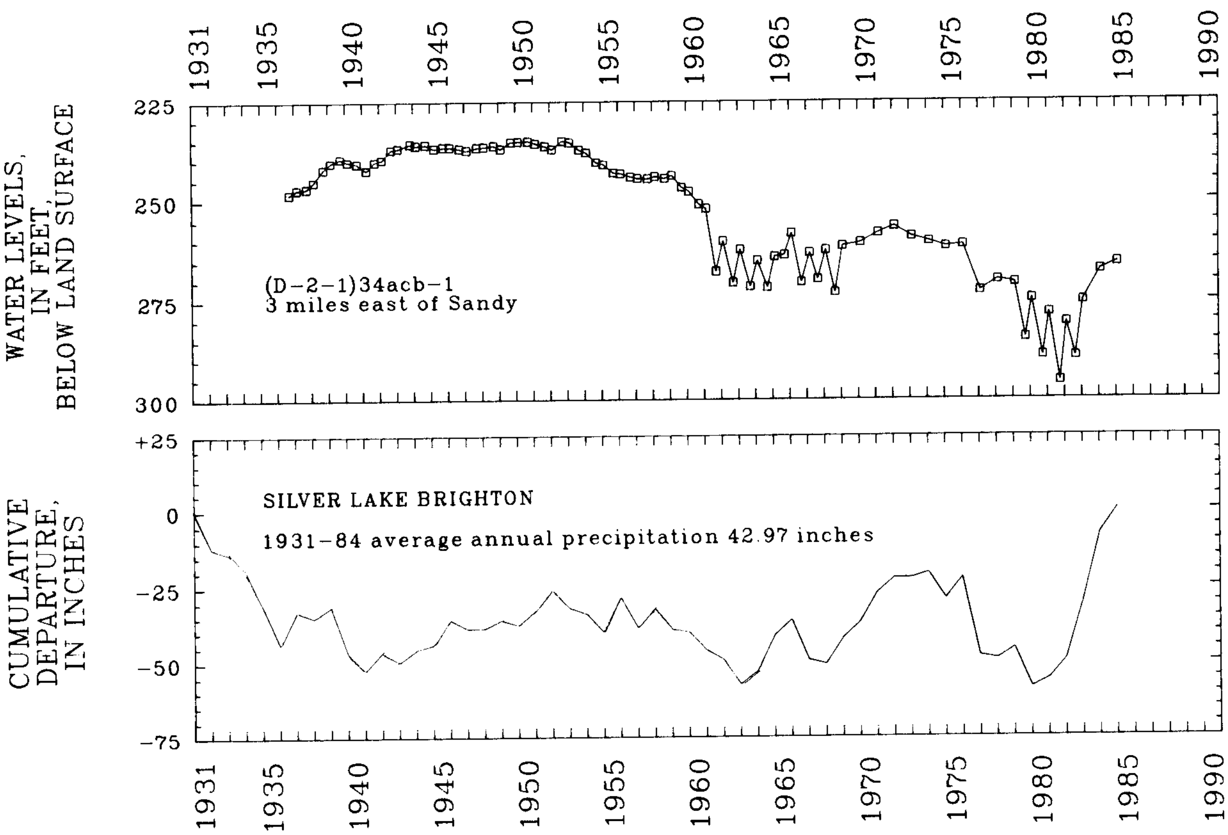

Figure 10.—Continued

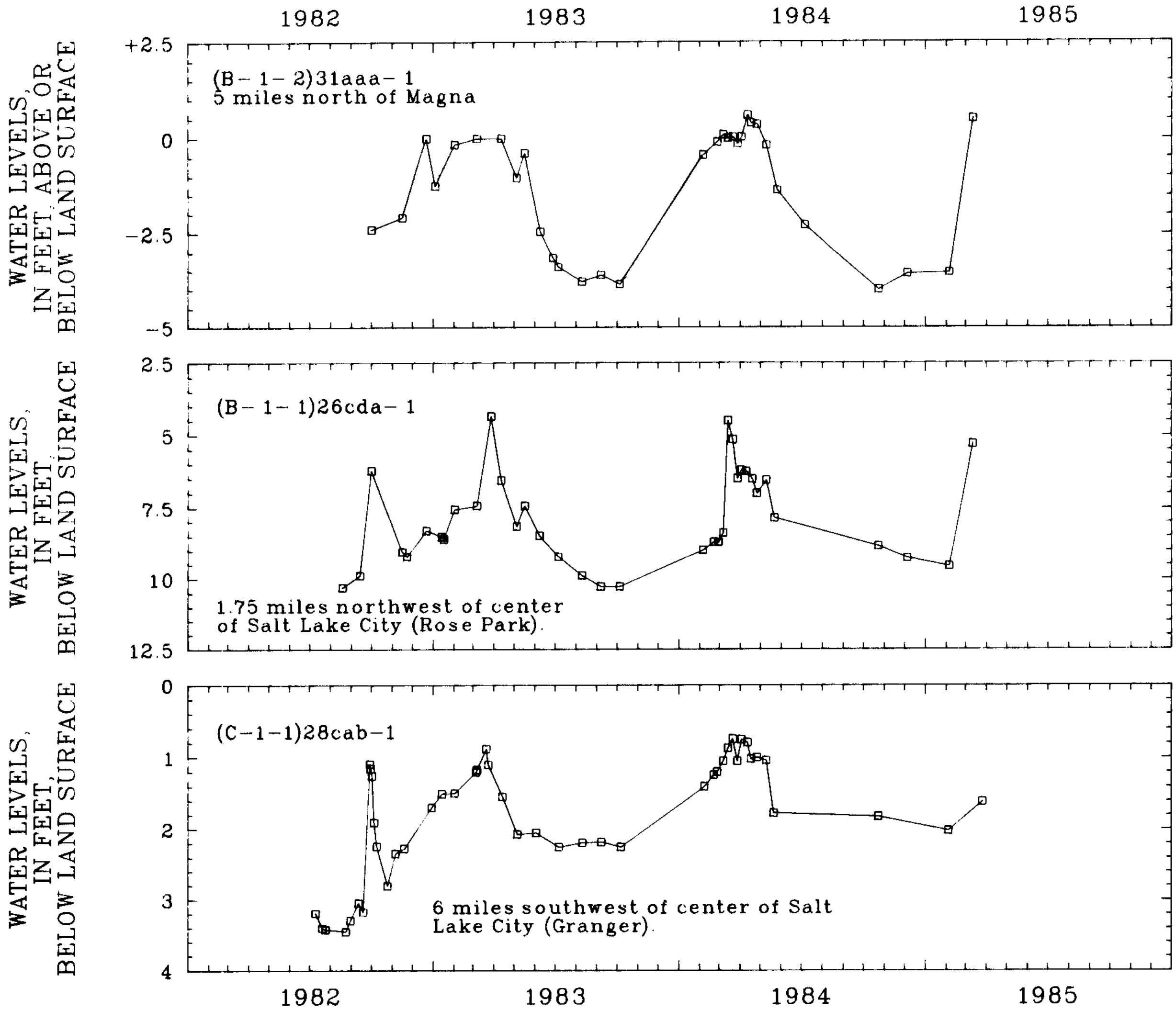

Figure 11.—Water levels in selected wells in the shallow water-table aquifer in Salt Lake Valley.

TOOELE VALLEY

by George Pyper

Approximately 23,000 acre-feet of water was withdrawn from wells for Tooele Valley in 1984. This is 1,000 acre-feet more than reported for 1983 and 5,000 acre-feet less than the average annual withdrawal for 1974-83 (table 2). The increase was due to small increases in all categories and also includes a change in the designated use of about 1,000 acre-feet of Industrial use that had previously been classed as Public Supply.

Discharge from Fishing Creek, Sixmile Creek, Mill Pond, and Dunnes Pond Springs (fig. 12) was approximately 31,500 acre-feet, which is 4,600 acre-feet more than reported in 1983. About 4,400 acre-feet of the spring discharge was used for irrigation and stock, about 15,000 acre-feet was diverted to Salt Lake Valley for industrial use, and the remaining 12,100 acre-feet spilled to the marsh areas adjoining Great Salt Lake. Additional spring flow of about 1,800 acre-feet discharged from Rose Spring, 2 miles southeast of Erda.

Water levels rose to record high levels throughout Tooele Valley from March 1984 to March 1985 except north of Grantsville, where no change or declines of less than 4 feet were recorded. Although declines are shown in this area the water levels are still near the all time high level. These declines are attributed to less recharge from precipitation (Grantsville precipitation is reported as 14.24 inches in 1984 as compared to 20.78 inches in 1983) and more pumping withdrawal in 1984. Rises of about 7 feet were recorded in the Tooele City area. These rises are attributed to continued above normal precipitation and the continued spreading of the excess flow of Settlement Canyon, southeast of Tooele City on the west benches. In the Erda area recorded rises generally ranged from 3 to 34 feet, however, one well north of Erda recorded arise of nearly 46 feet. Rises in the Erda area are attributed to reduced the pumping and to recharge from spreading excess flows from canyons east of Tooele City.

The relation of water levels in selected observation wells, precipitation at Tooele, and annual withdrawals from wells is shown in figure 13. Precipitation at Tooele in 1984 was 27.43 inches, which is 10.31 inches above the average annual precipitation for 1936-84, and is the third consecutive year with annual precipitation greater than 8 inches above the average annual precipitation.

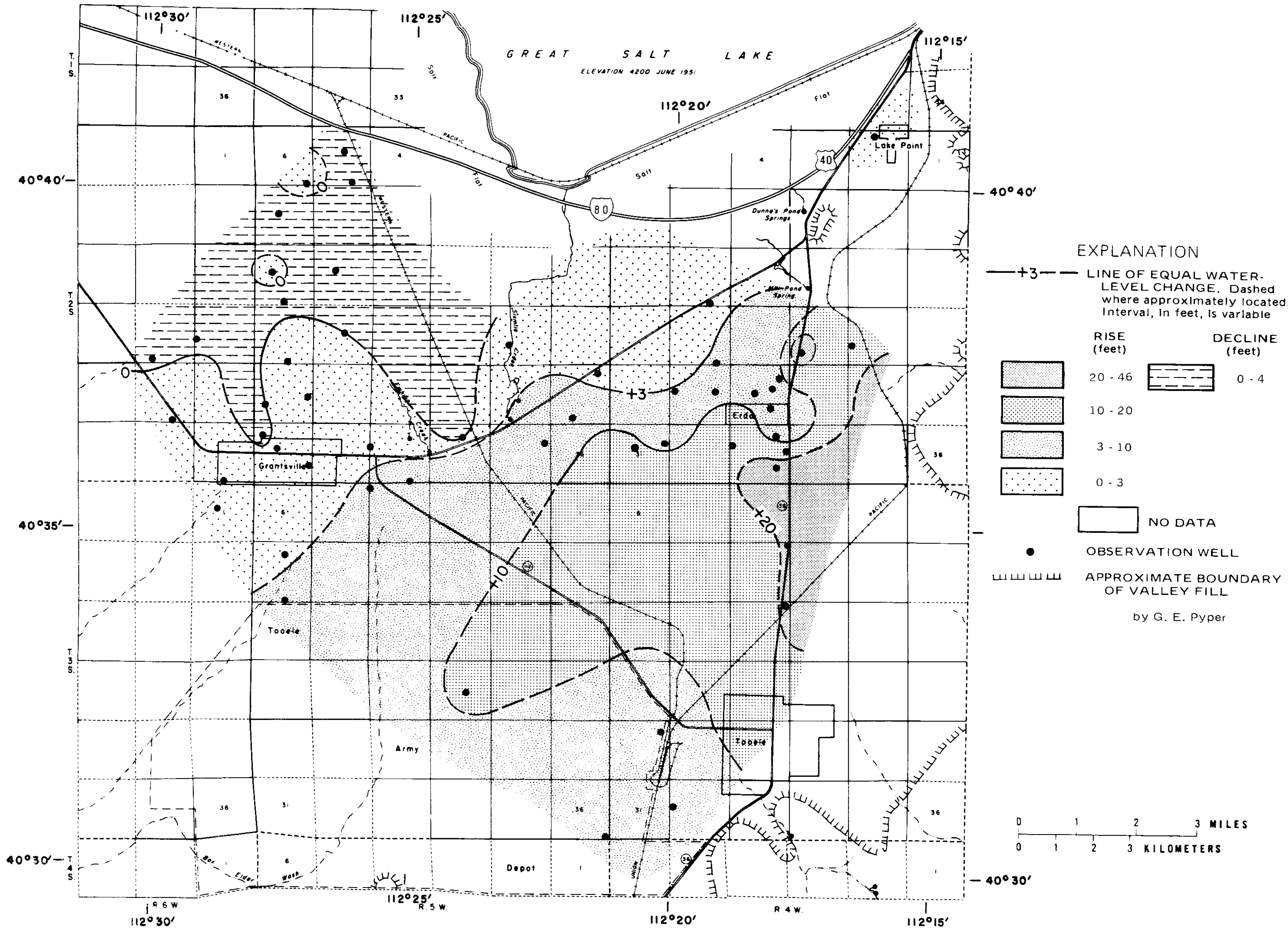

Figure 12.—Map of Tooele Valley showing change of water levels in artesian aquifers from March 1984 to March 1985.

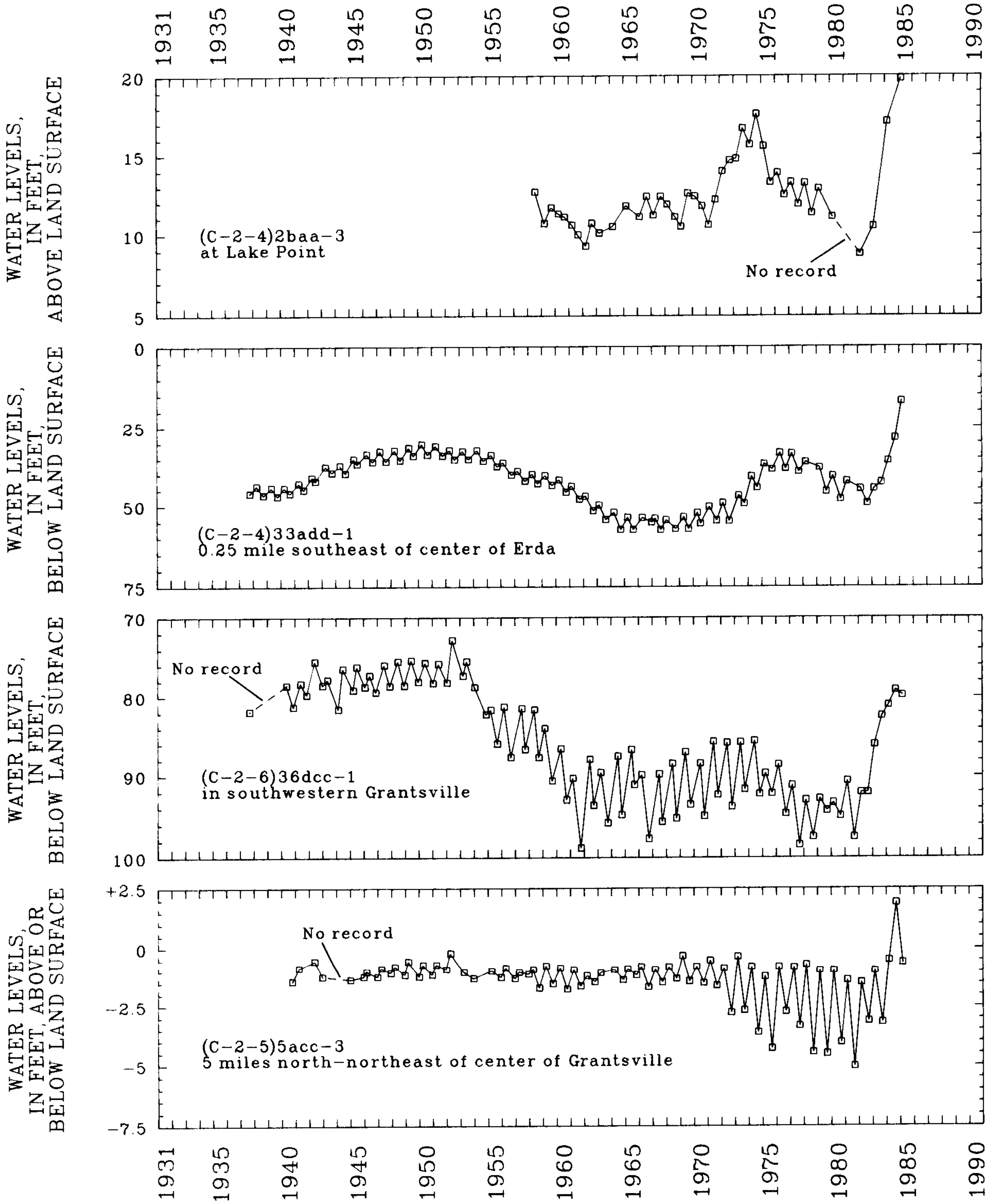

Figure 13.—Relation of water levels in selected wells in Tooele Valley to cumulative departure from the average annual precipitation at Tooele and to annual withdrawals from wells.

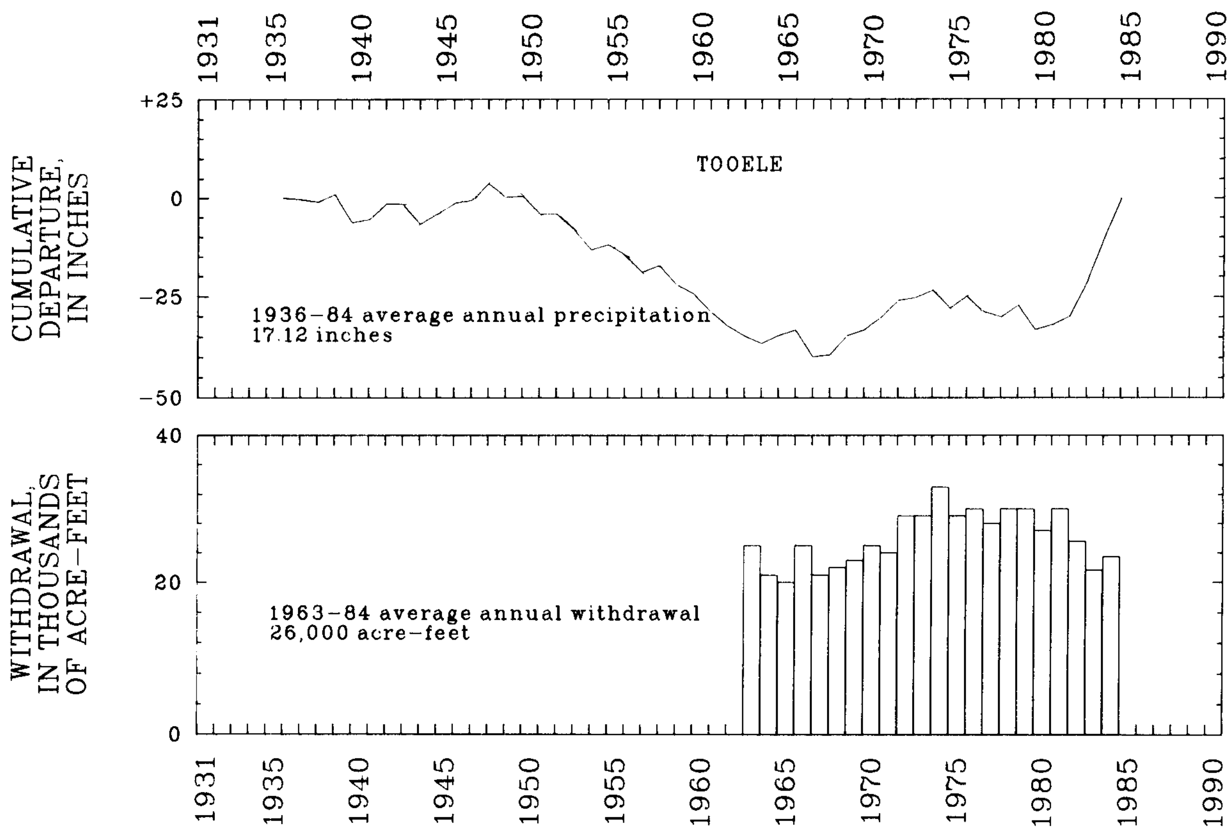

Figure 13.—Continued

UTAH AND GOSHEN VALLEYS

by Carole Burden

Withdrawal of water from wells in Utah and Goshen Valleys in 1984 was about 78,000 acre-feet. This was 4,000 acre-feet more than in 1983 and 22,000 acre-feet less than the average annual withdrawal for 1974-83 (table 2). Withdrawal in Utah Valley was 70,000 acre-feet, or 2,000 acre-feet more than in 1983. Withdrawal in Goshen Valley was 8,000 acre-feet, or 2,000 acre-feet more than in 1983. These increases were mainly due to increased withdrawal for irrigation and municipal use.

Water levels throughout Goshen Valley rose from March 1984 to March 1985 (fig. 14). These rises were due to above average precipitation and increased ground-water recharge. Water levels in Utah Valley generally rose from March 1984 to March 1985, except in the Lehi-American Fork area where levels generally declined (figs. 14-17). The rises were due to above average precipitation and increased ground-water recharge; the declines were due to continued large withdrawals for municipal use.

The relation of water levels in selected observation wells to precipitation, total annual withdrawal from wells, annual withdrawals for public supply, and estimated population of Utah County is shown in figure 18.

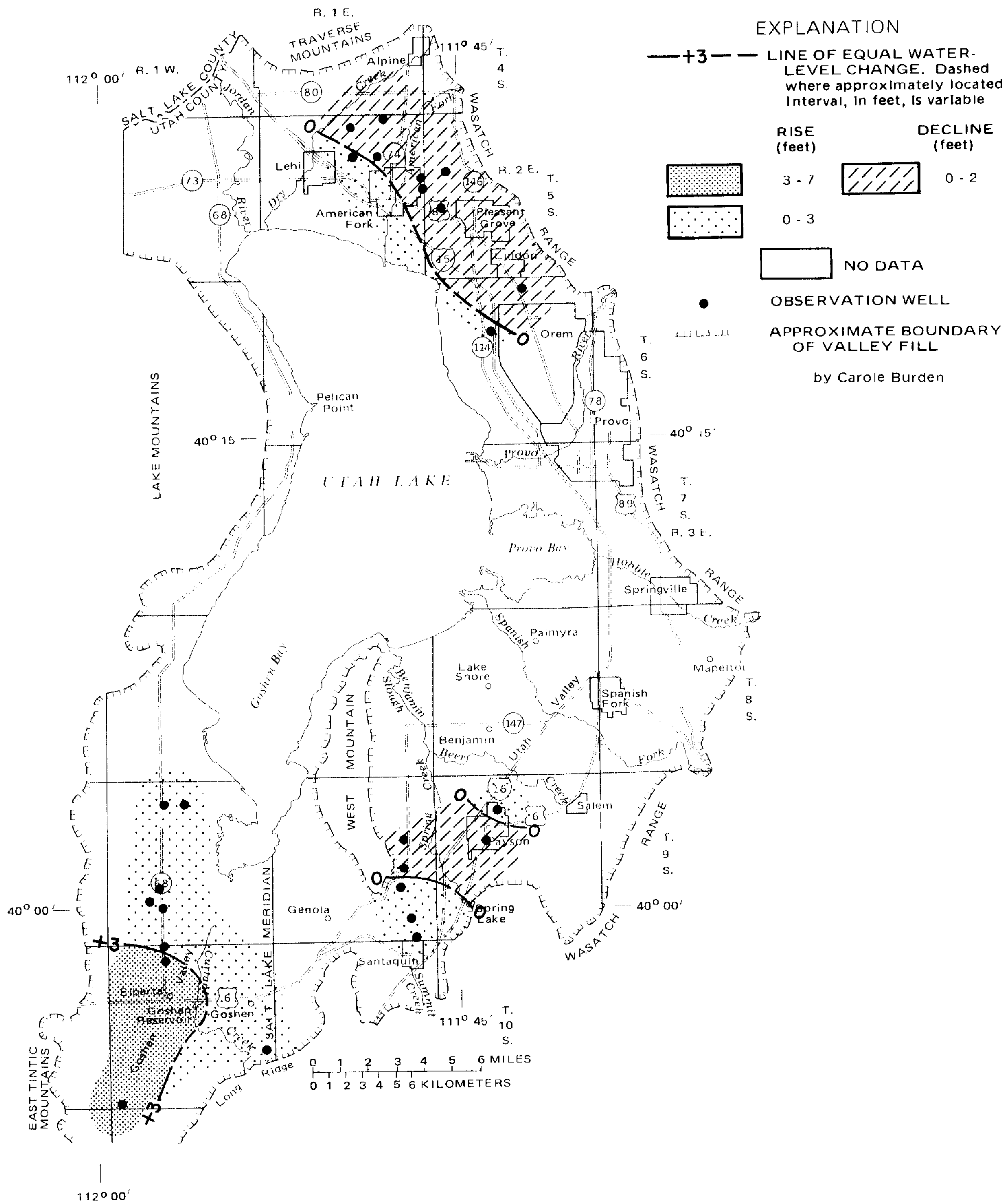

Figure 14.—Map of Utah and Goshen Valleys showing change of water levels in the water-table aquifers from March 1984 to March 1985.

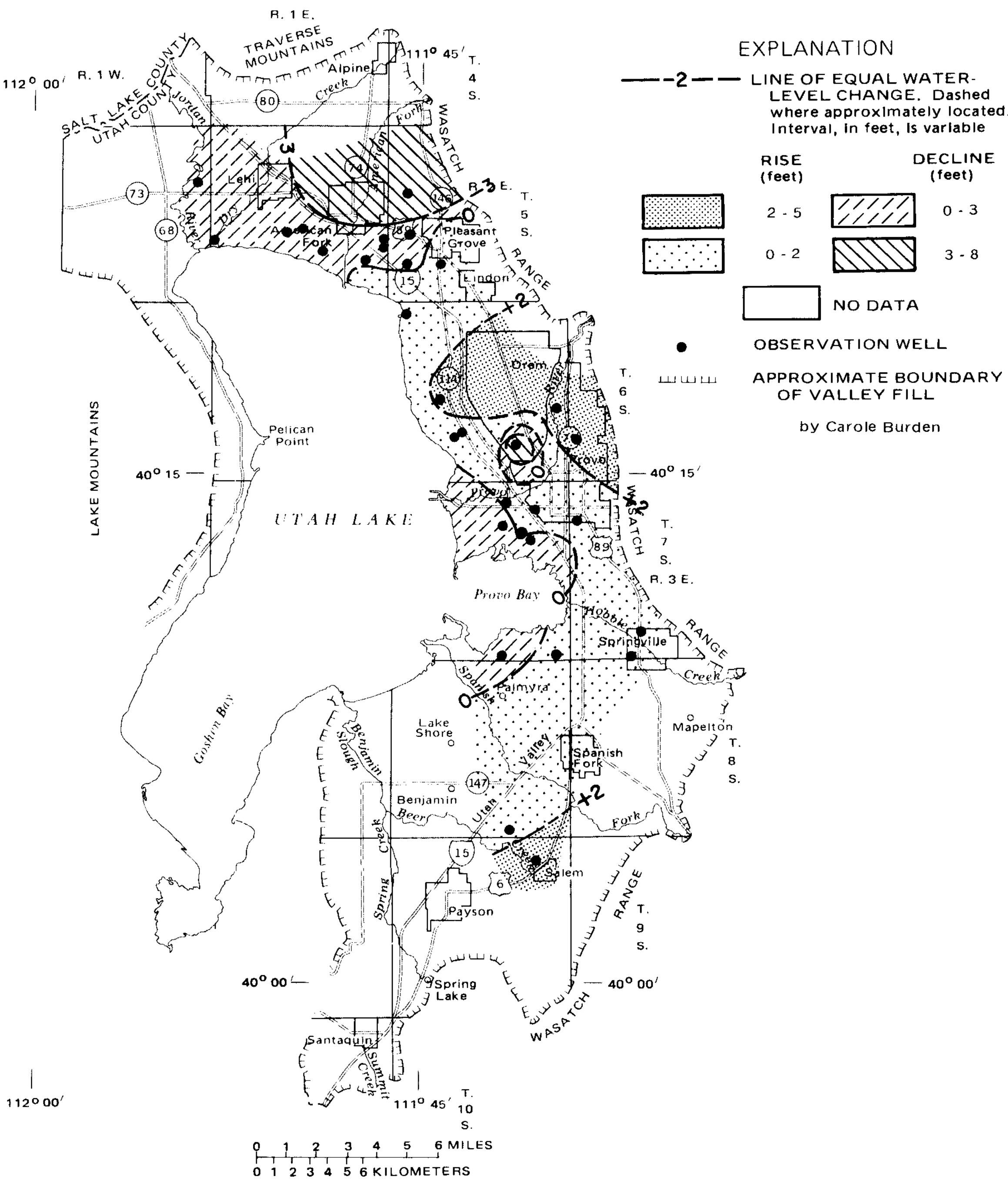

Figure 15.—Map of Utah Valley showing change of water levels in the shallow artesian aquifer in deposits of Pleistocene age from March 1984 to March 1985.

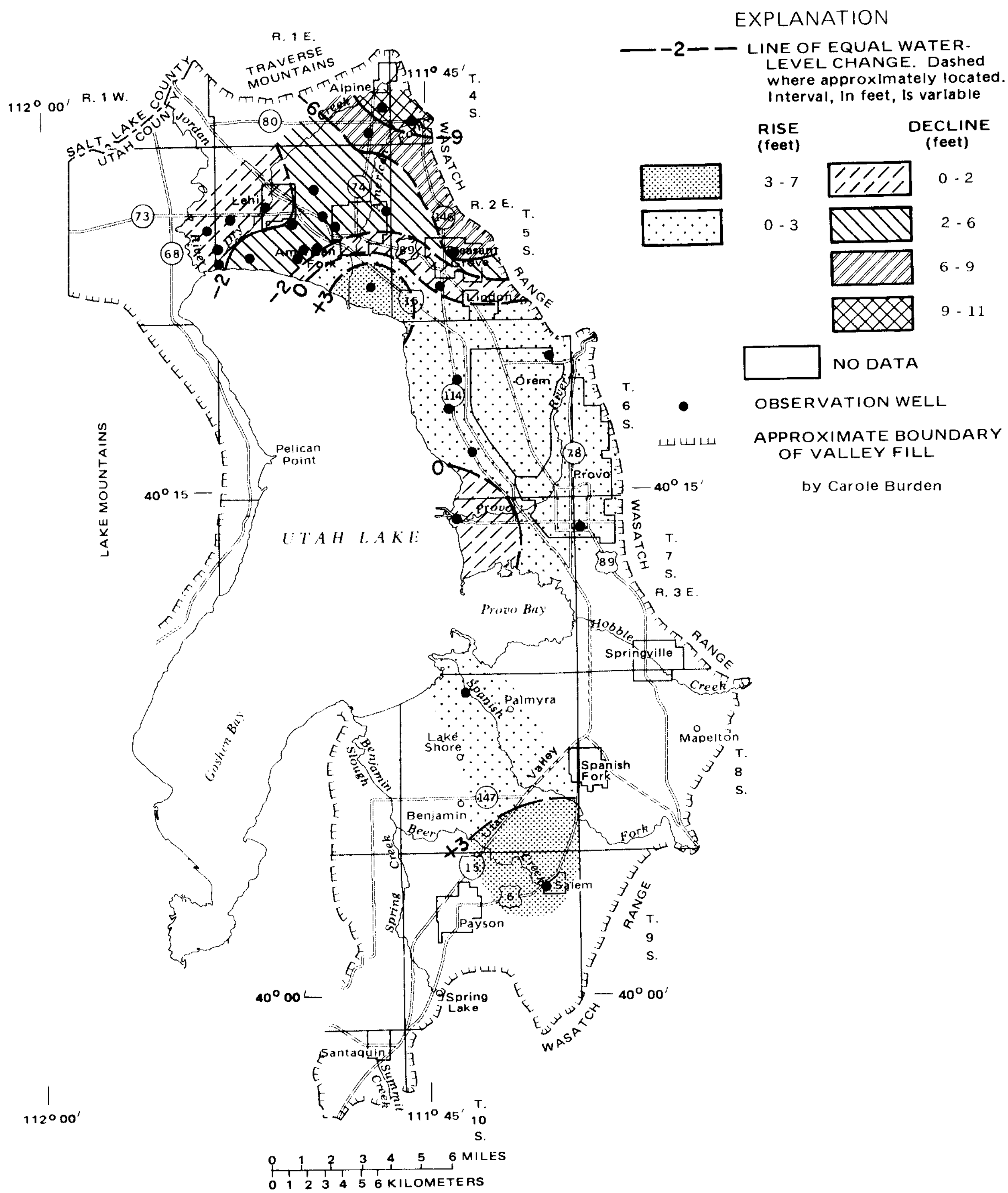

Figure 16.—Map of Utah Valley showing change of water levels in the deep artesian aquifer in deposits of Pleistocene age from March 1984 to March 1985.

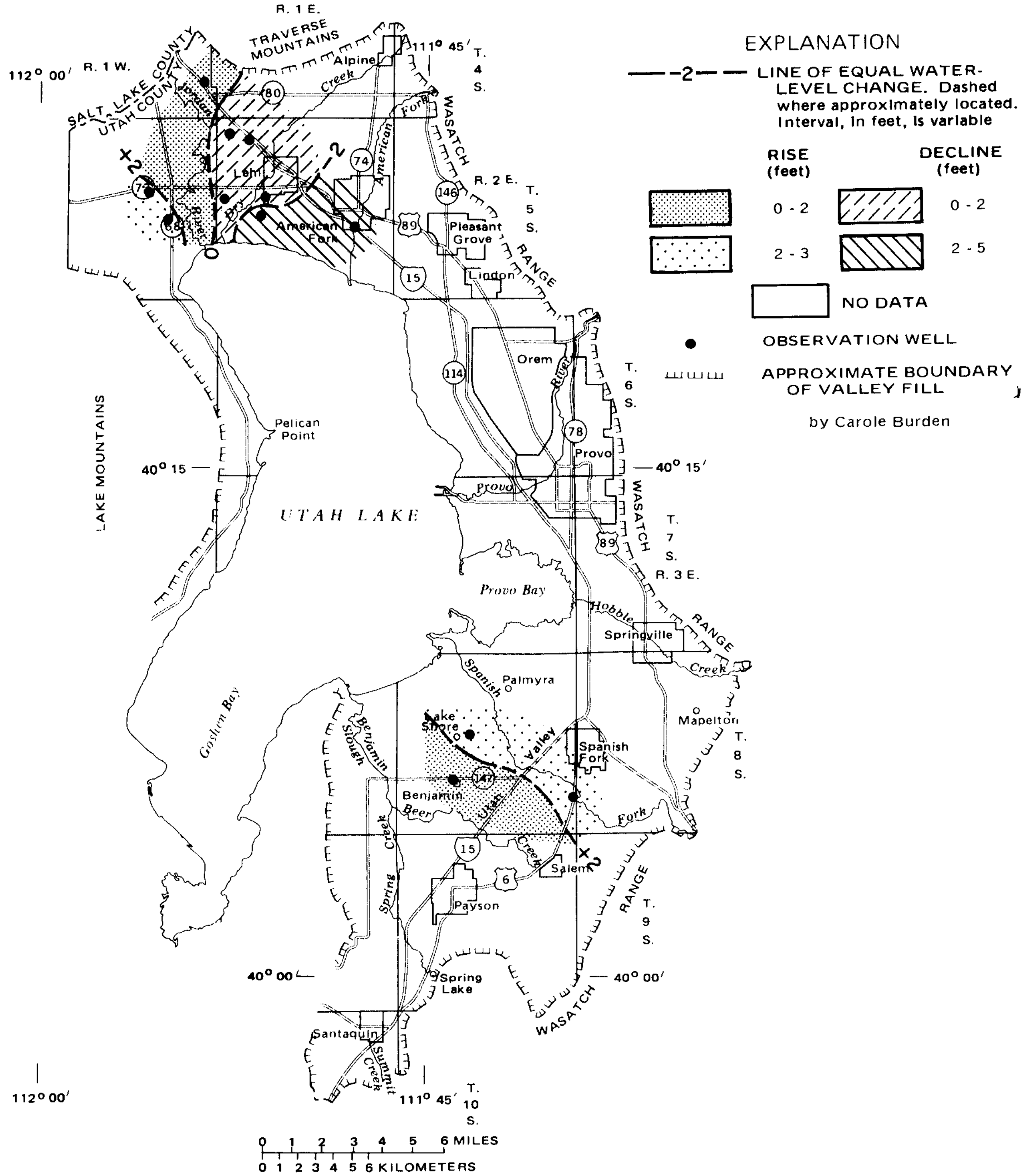

Figure 17.—Map of Utah Valley showing change of water levels in the artesian aquifer in deposits of Quaternary or Tertiary age from March 1984 to March 1985.

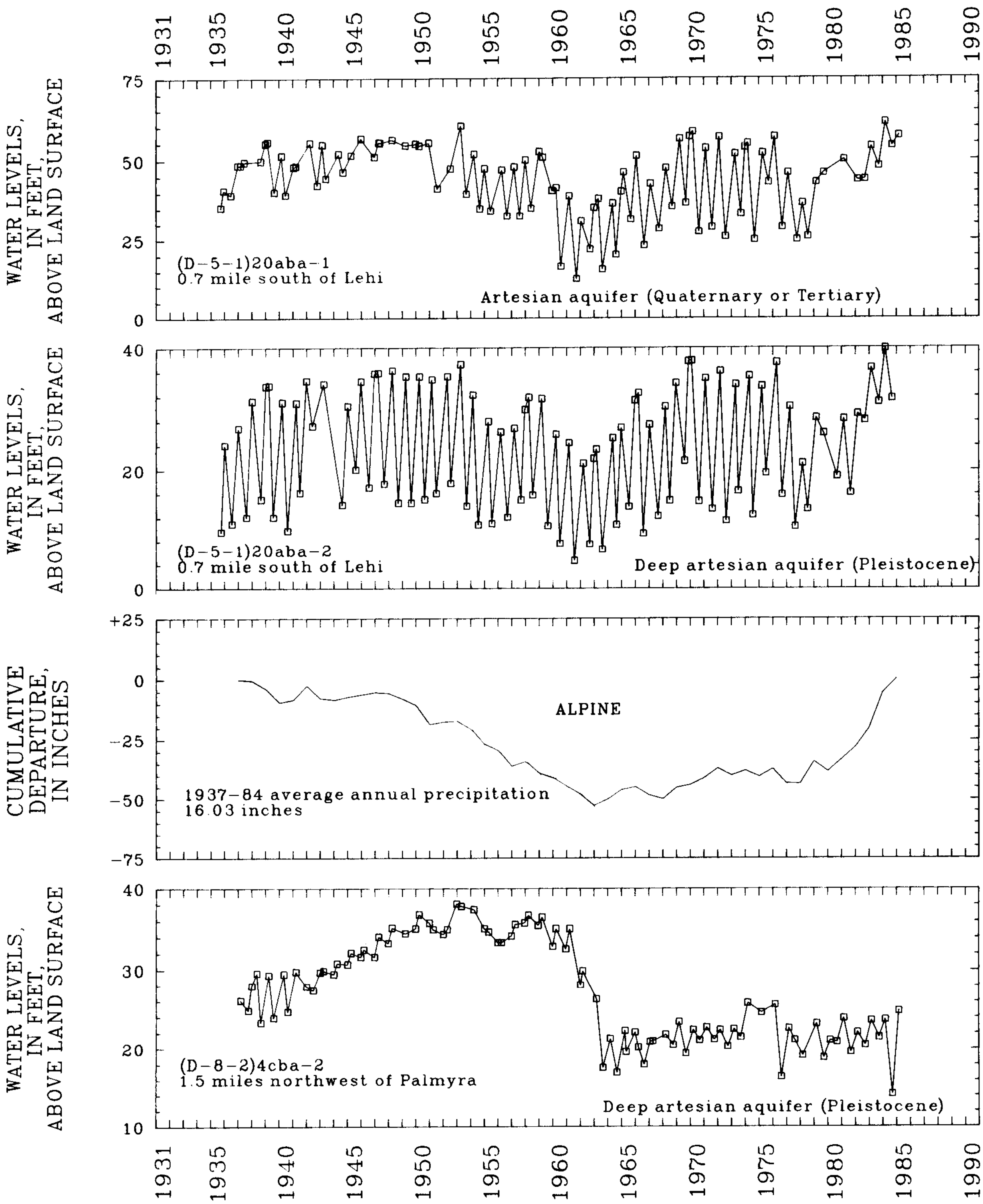

Figure 18.—Relation of water levels in selected wells to cumulative departure from the average annual precipitation at Alpine and Spanish Fork Powerhouse, and total annual withdrawals from wells, and annual withdrawals for public supply in Utah and Goshen Valleys, and estimated population of Utah County.

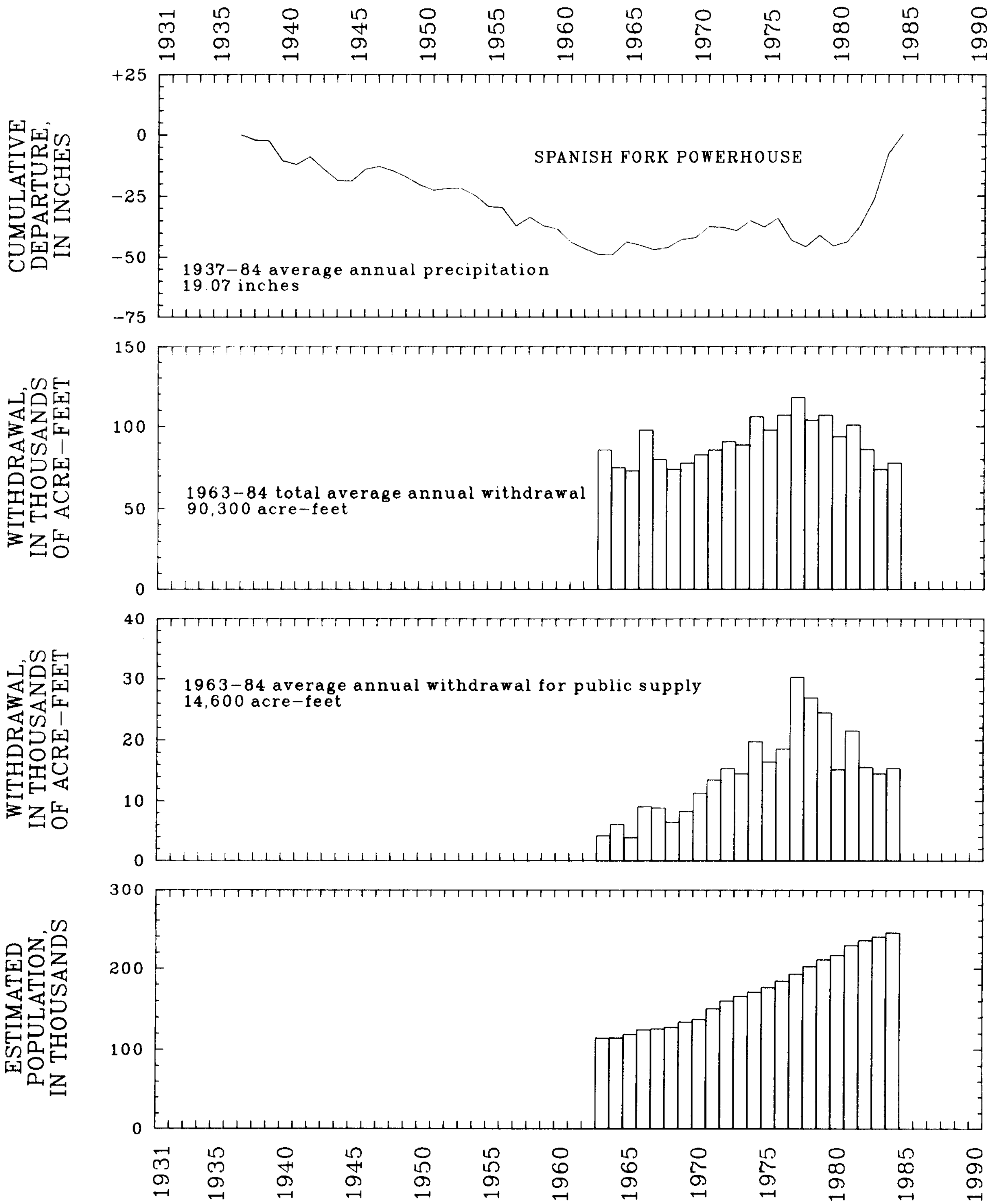

Figure 18.—Continued

JUAB VALLEY

by V.L. Jensen

Withdrawal of water from wells in Juab Valley during 1984 was about 6,000 acre-feet. This is the same as reported for 1983 and 15,000 acre-feet less than the average annual withdrawal for 1974-83 (table 2). The decrease in withdrawal was due mostly to the increased amount of surface water available for irrigation.

Water levels rose throughout the valley from March 1984 to March 1985 (figure 19). The largest measured rise of 13.1 feet was in the Levan Ridge area.

The relation of water levels in two observation wells, annual withdrawals from wells, and cumulative departure from the average annual precipitation for 1935-84 at Nephi is shown in figure 20. Precipitation at Nephi during 1984 was 16.27 inches, which is 2.04 inches above the average annual precipitation for 1935-84.

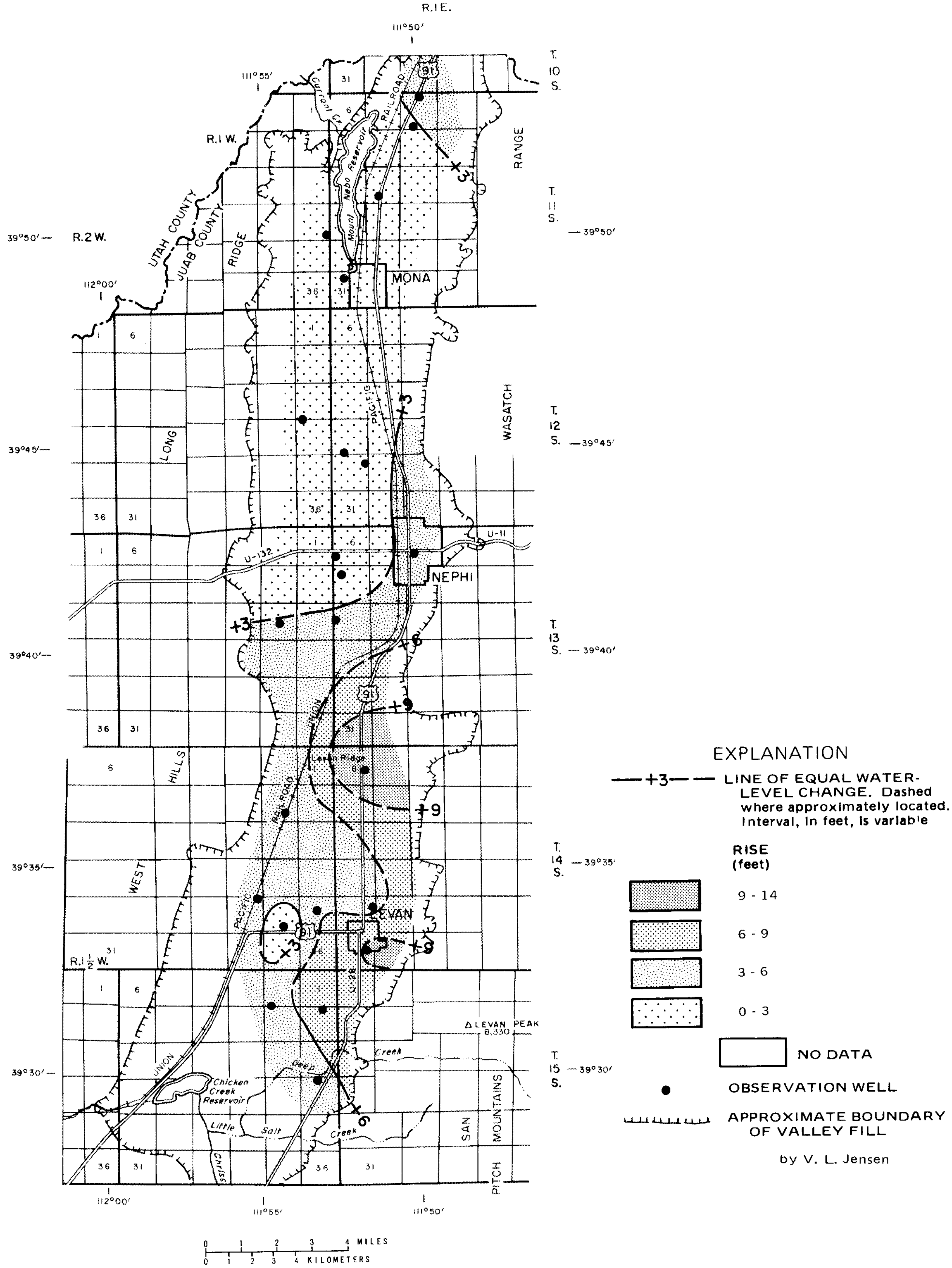

Figure 19.—Map of Juab Valley showing change of water levels from March 1984 to March 1985.

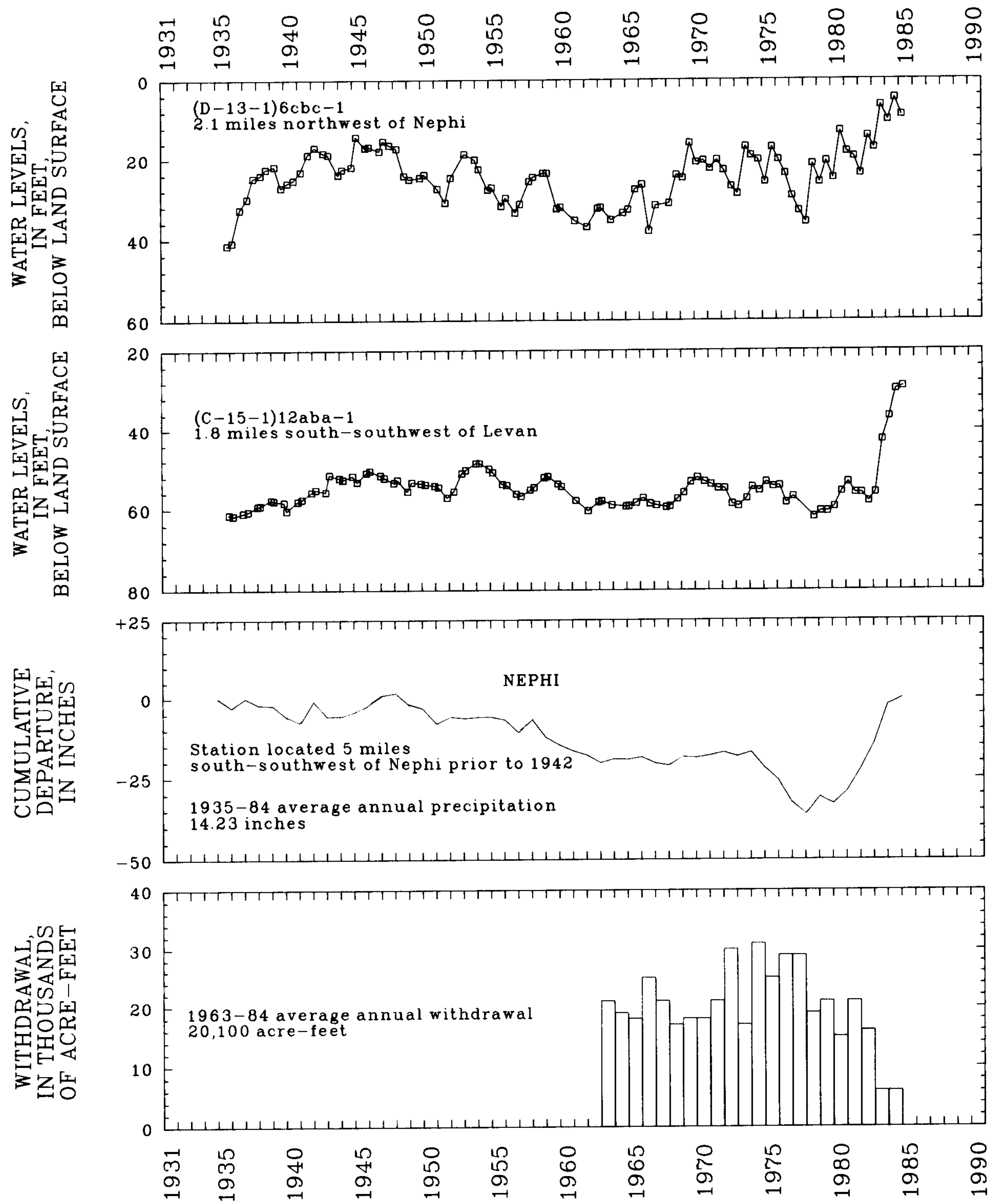

Figure 20.—Relation of water levels in selected wells in Juab Valley to cumulative departure from the average annual precipitation at Nephi and to annual withdrawals from wells.

SEVIER DESERT

by Michael Enright

Withdrawal of water from wells in the Sevier Desert in 1984 was about 10,000 acre-feet. This was 2,000 acre-feet more than was reported for 1983 and about 18,000 acre-feet less than the 1974-83 average annual withdrawal (table 2). The relatively small withdrawal during 1984 was due to the availability of above normal supplies of surface water for irrigation. During 1984 the Sevier River near Juab discharged 991,600 acre-feet (fig. 21). This was 72,700 acre-feet more than the 1983 discharge,and about 816,000 acre-feet more than the 1935-84 average annual discharge.

In those parts of the Sevier Desert where observation wells are located, water levels rose from March 1984 to March 1985 in all but two of the observation wells (figs. 22 and 23). The largest observed water level rise in the upper and lower artesian aquifers was about 9 feet along the eastern edge of the Sevier Desert. These rises can be attributed to continued below average ground-water withdrawals and above average surface-water supplies for irrigation and ground-water recharge. The only observed water-level decline in the upper artesian aquifer occurred in a well two miles northwest of Hinkley. The only observed water-level decline in the lower artesian aquifer occured in a well about 11 miles south of Deseret.

The long-term relation of precipitation at Oak City, discharge of the Sevier River near Juab, water levels in selected wells, and annual withdrawals from wells are shown in figure 21. Precipitation at Oak City in 1984 was 18.97 inches, 6.14 inches above the 1935-84 average annual precipitation.

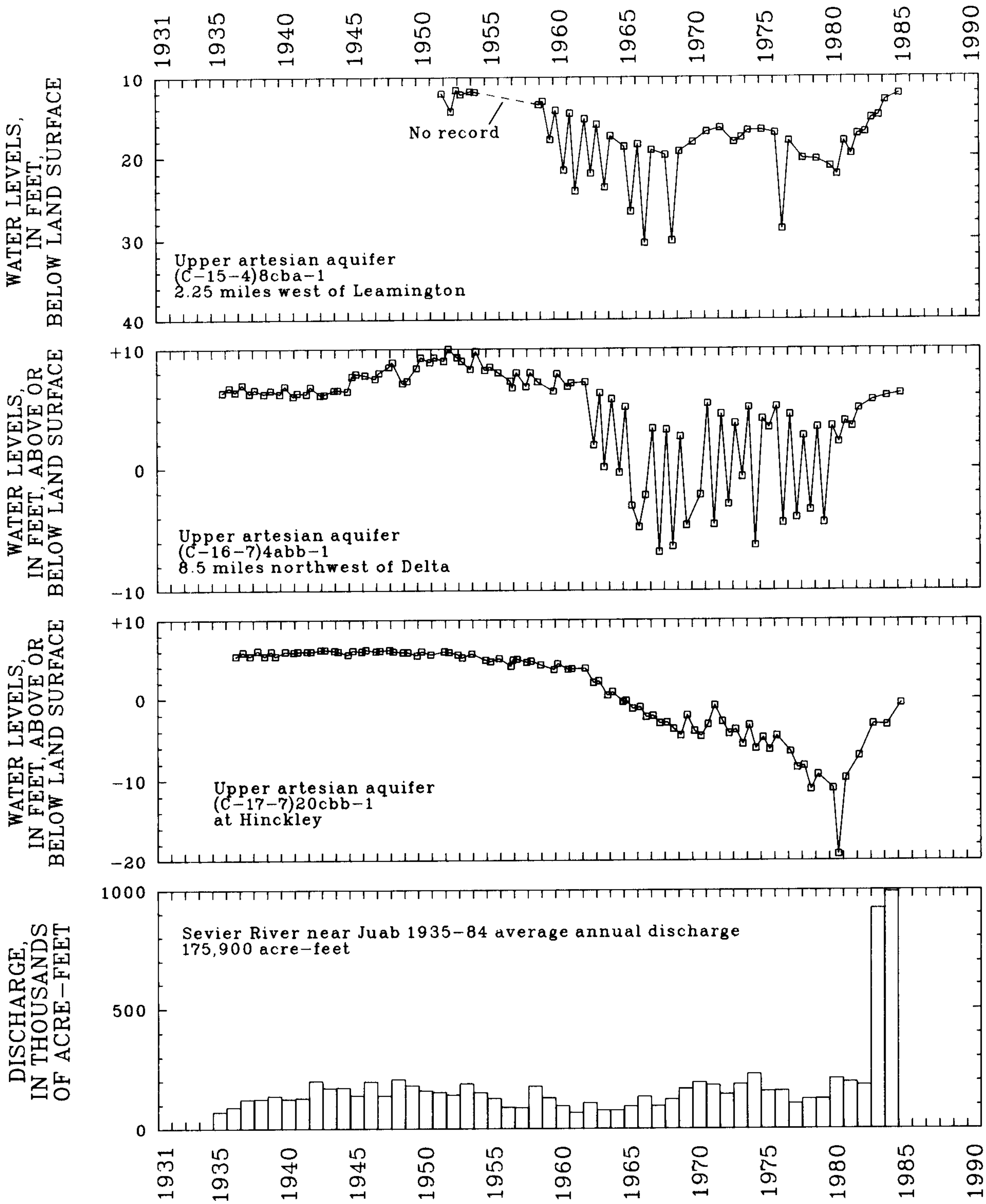

Figure 21.—Relation of water levels in selected wells in the Sevier Desert to discharge of the Sevier River near Juab, to cumulative departure from the average annual precipitation at Oak City, and to annual withdrawals from wells.

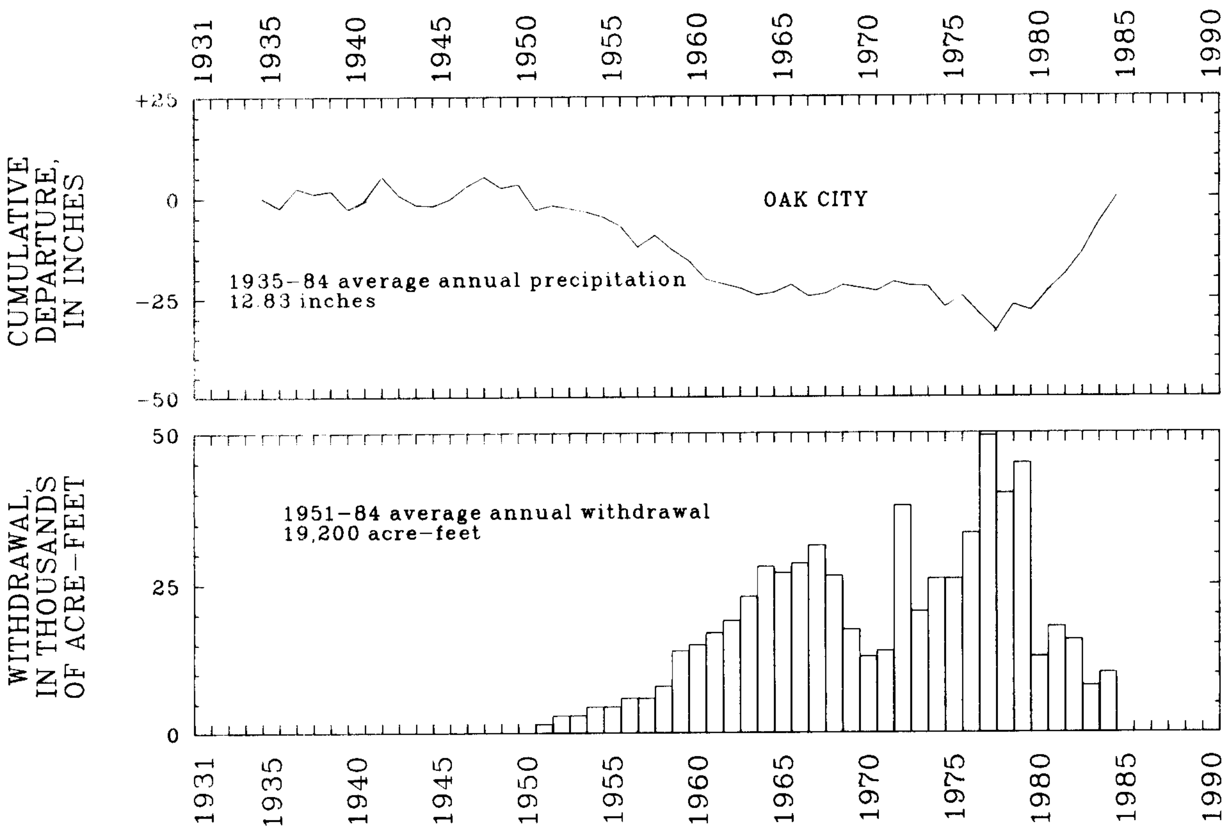

Figure 21.—Continued

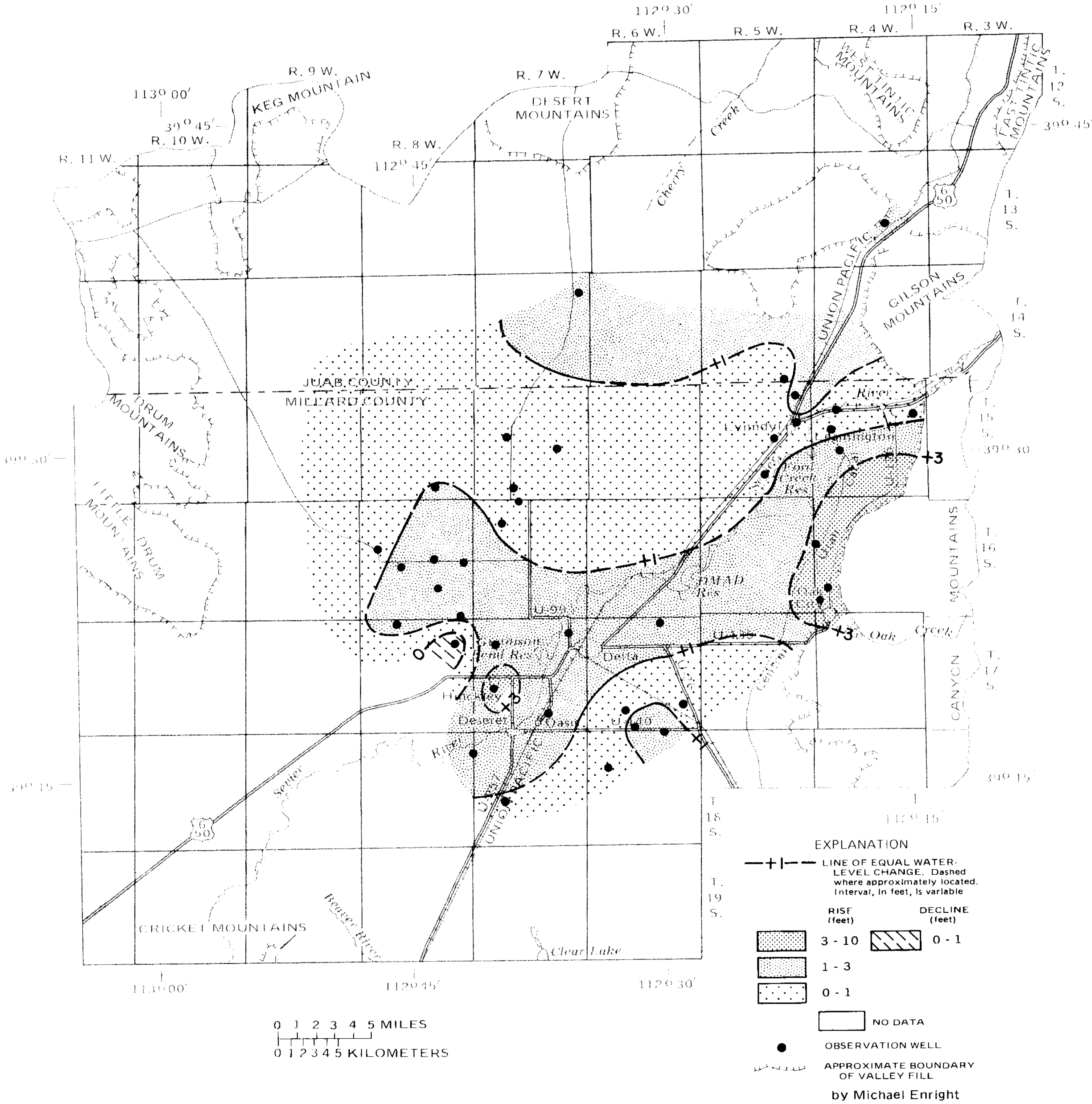

Figure 22.—Map of part of the Sevier Desert showing change of water levels in the upper artesian aquifer from March 1984 to March 1985.

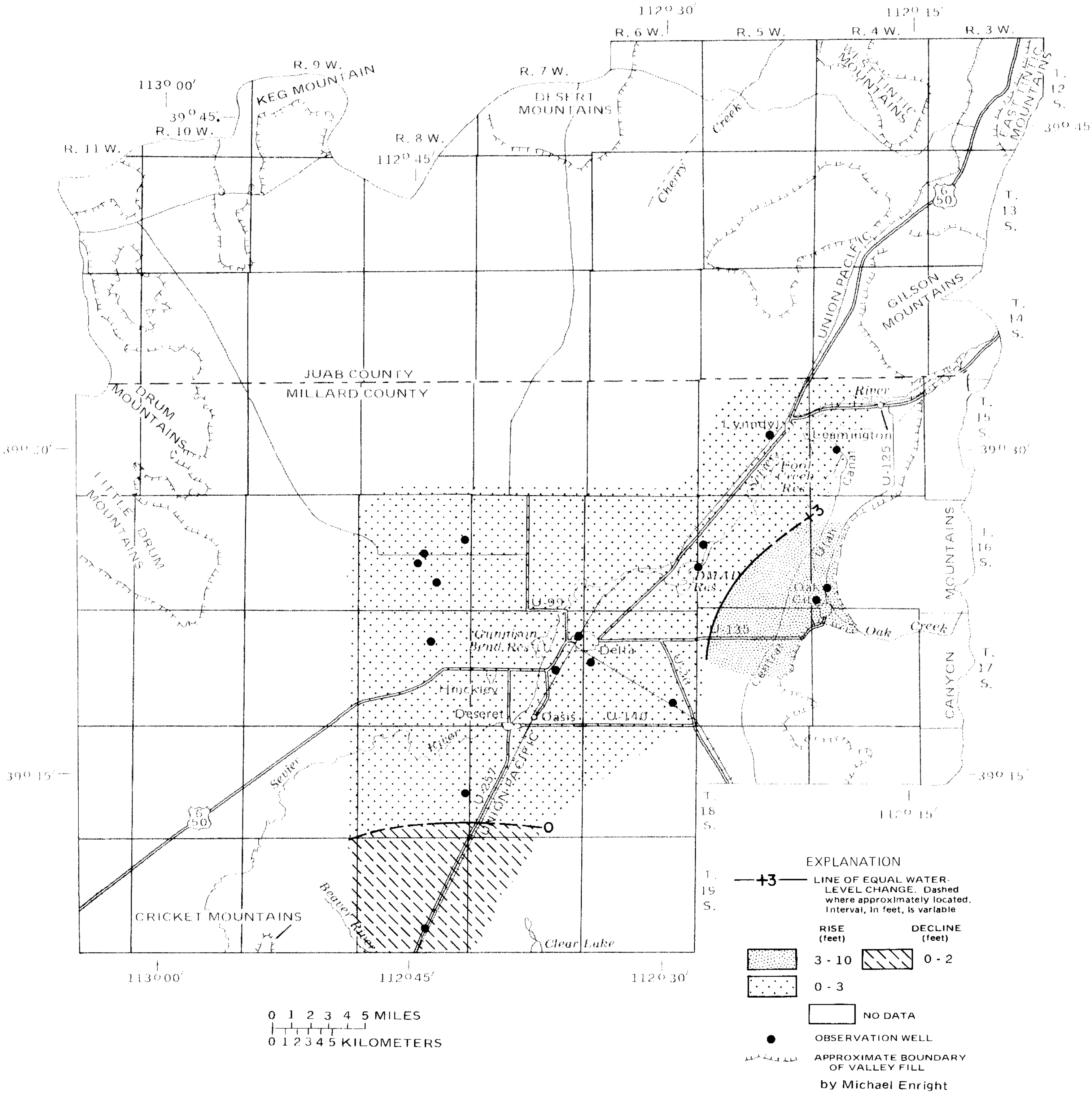

Figure 23.—Map of part of the Sevier Desert showing change of water levels in the lower artesian aquifer from March 1984 to March 1985.

UPPER AND CENTRAL SEVIER VALLEYS AND UPPER FREMONT RIVER VALLEY

By D. C. Emett

Withdrawal of water from wells in the upper and central Sevier Valleys and upper Fremont River valley was approximately 20,000 acre-feet in 1984, 1,000 acre-feet less than in 1983 and about 4,000 acre-feet less than the average annual withdrawal for 1974-83 (table 2). The decrease was caused mostly by smaller withdrawals for domestic and stock and public supply. Several municipalities reported increased spring flows.

Water levels declined from March 1984 to March 1985 in 15 of 27 observation wells (fig. 24). The largest observed water-level decline, 3.6 feet, was in a stock well northeast of Richfield. The largest observed water-level rise was 1.5 feet in a well in Kingston. This rise probably reflects the above-normal contents of Piute Reservoir.

The relation of water levels in selected wells to discharge of the Sevier River at Hatch, and precipitation at Panguitch, Salina, and Loa is shown in figure 25. Precipitation was above average at all three stations and the discharge of the Sevier River at Hatch was 88,300 acre-feet in 1984 and 8,000 acre-feet more than the average for 1940-84 but only 46% of the 1983 discharge.

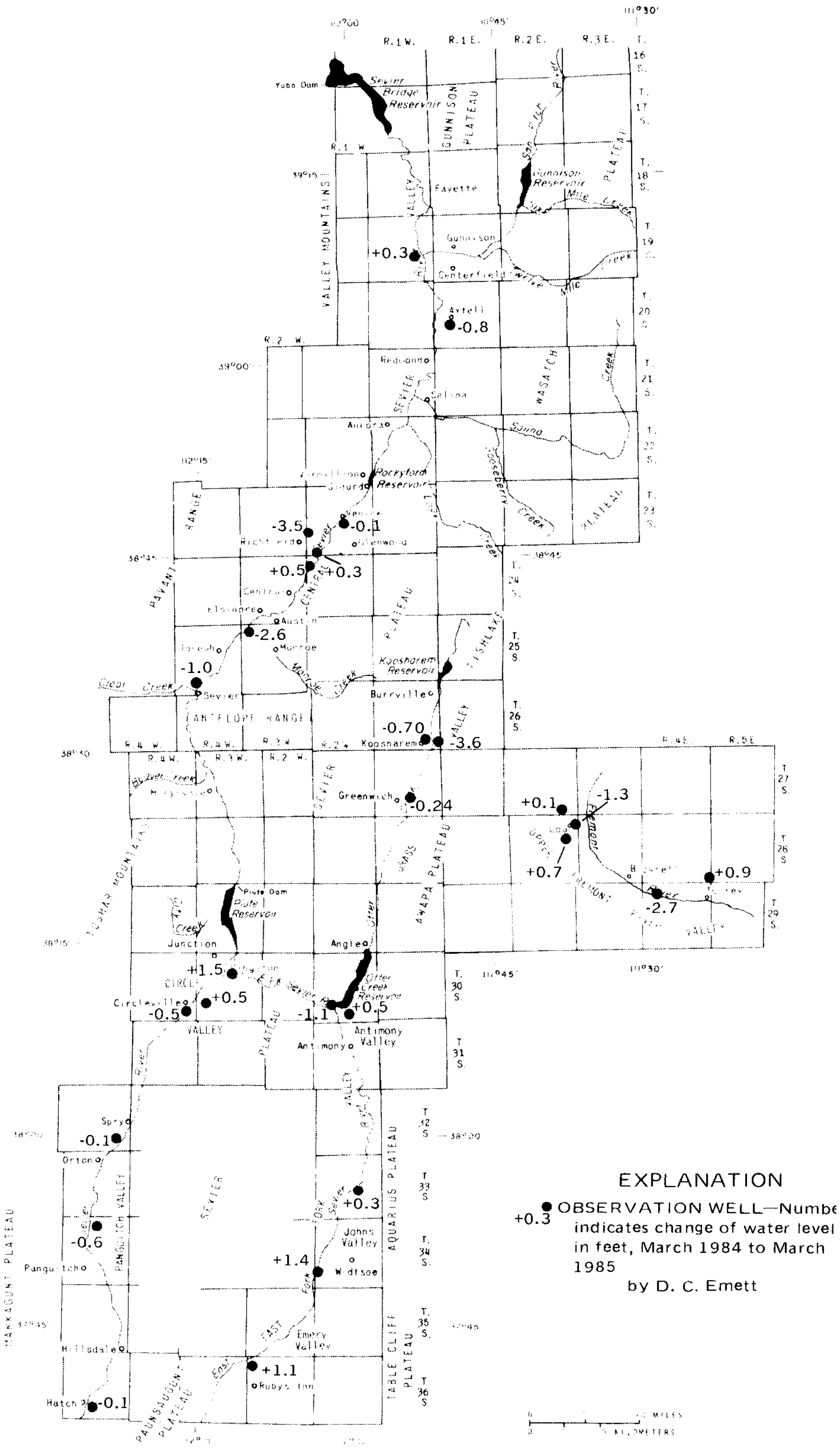

Figure 24.—Map of the upper and central Sevier Valleys and upper Fremont River valley showing change of water levels from March 1984 to March 1985.

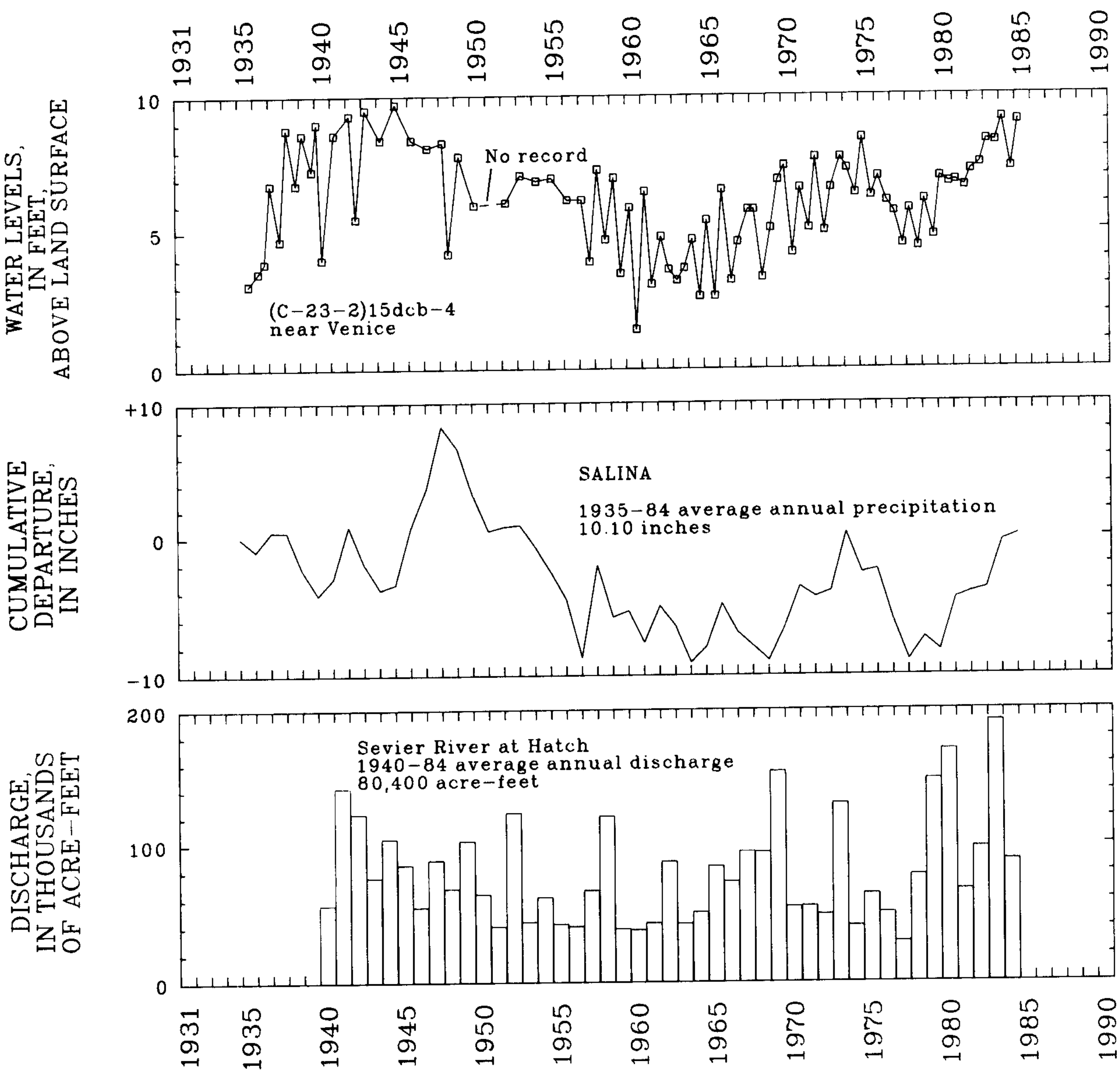

Figure 25.—Relation of water levels in selected wells to discharge of the Sevier River at Hatch, to cumulative departure from average annual precipitation at selected climate stations, and to annual withdrawal from wells—upper and central Sevier Valleys and upper Fremont River valley.

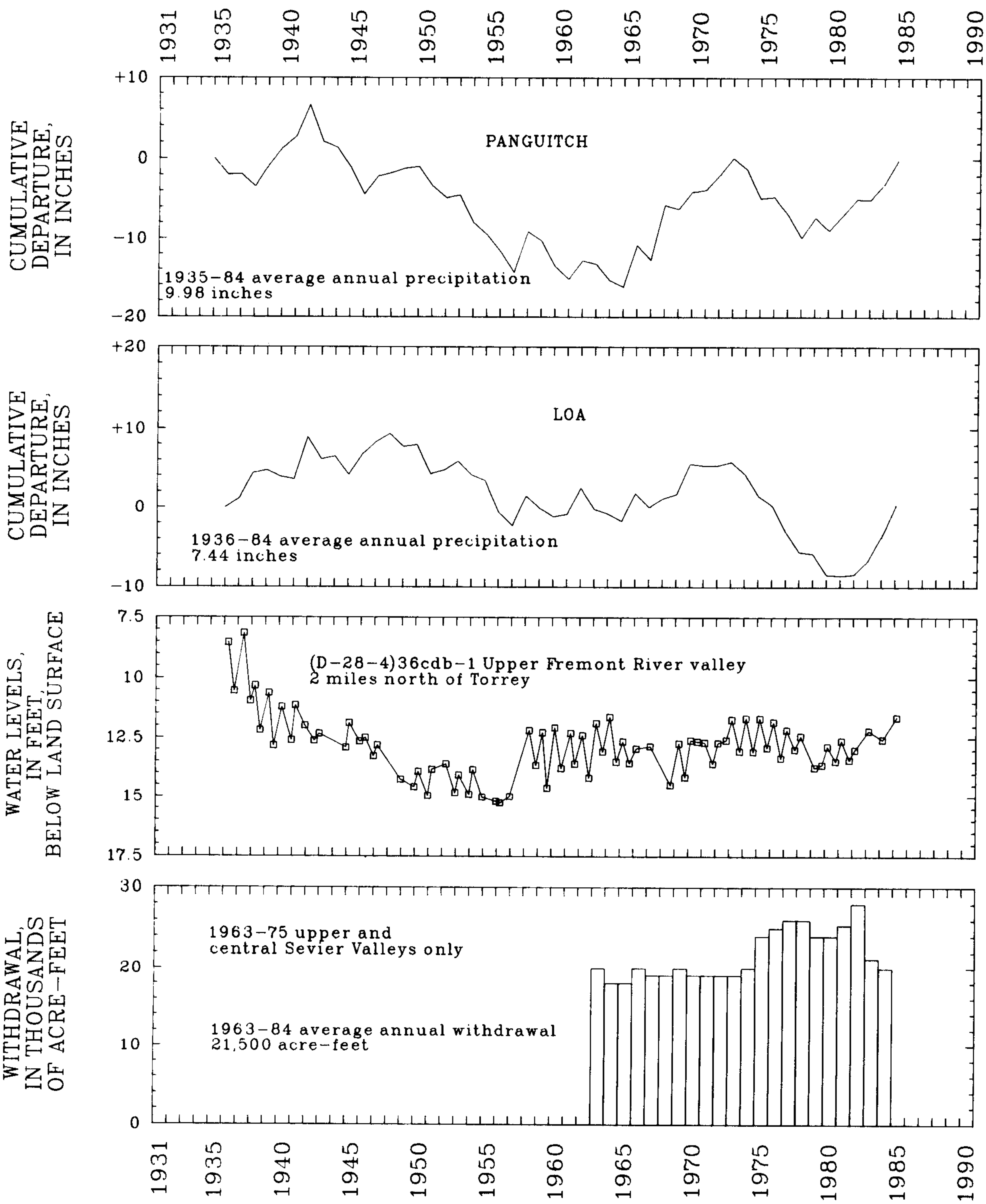

Figure 25.—Continued

PAHVANT (PAVANT) VALLEY

by Michael Enright

Withdrawal of water from wells in Pahvant (Pavant) Valley in 1984 was about 33,000 acre-feet, which was 9,000 acre-feet less than reported for 1983 and 52,000 acre-feet less than the average annual withdrawal for 1974-83 (table 2). The change from 1983 to 1984 was mainly due to decreased withdrawals for irrigation combined with above average precipitation.

Water levels in all but two observation wells rose from March 1984 to March 1985 (fig. 26), with a maximum observed rise of almost 39 feet in a well about four miles north-east of Flowell. Water levels in some wells have risen to nearly predevelopment levels and some wells that never flowed before began to flow by March 1985.

The long-term relation of precipitation at Fillmore, water-levels in selected observation wells, and annual withdrawals from wells are shown in figure 27. Precipitation in Fillmore in 1984 was 20.55 inches, which is 5.63 inches above the average annual precipitation for 1931-84.

Variations in dissolved-solids concentrations in water from four wells in Pahvant (Pavant) Valley are shown in figure 28. Only one of these wells was sampled during 1984 and it showed an increase in dissolved-solids concentration when compared with the 1982 concentration.

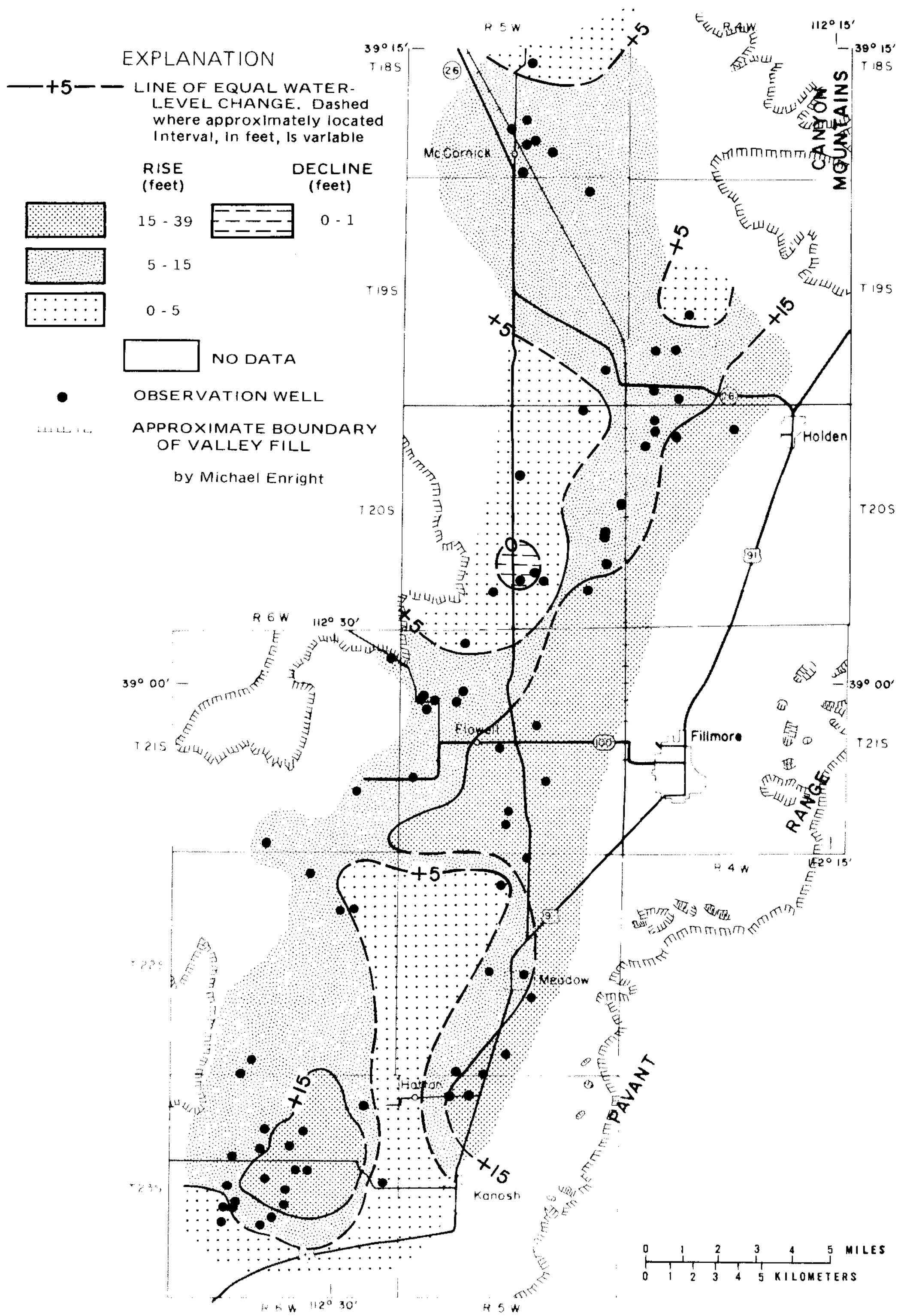

Figure 26.—Map of Pahvant Valley showing change of water levels from March 1984 to March 1985.

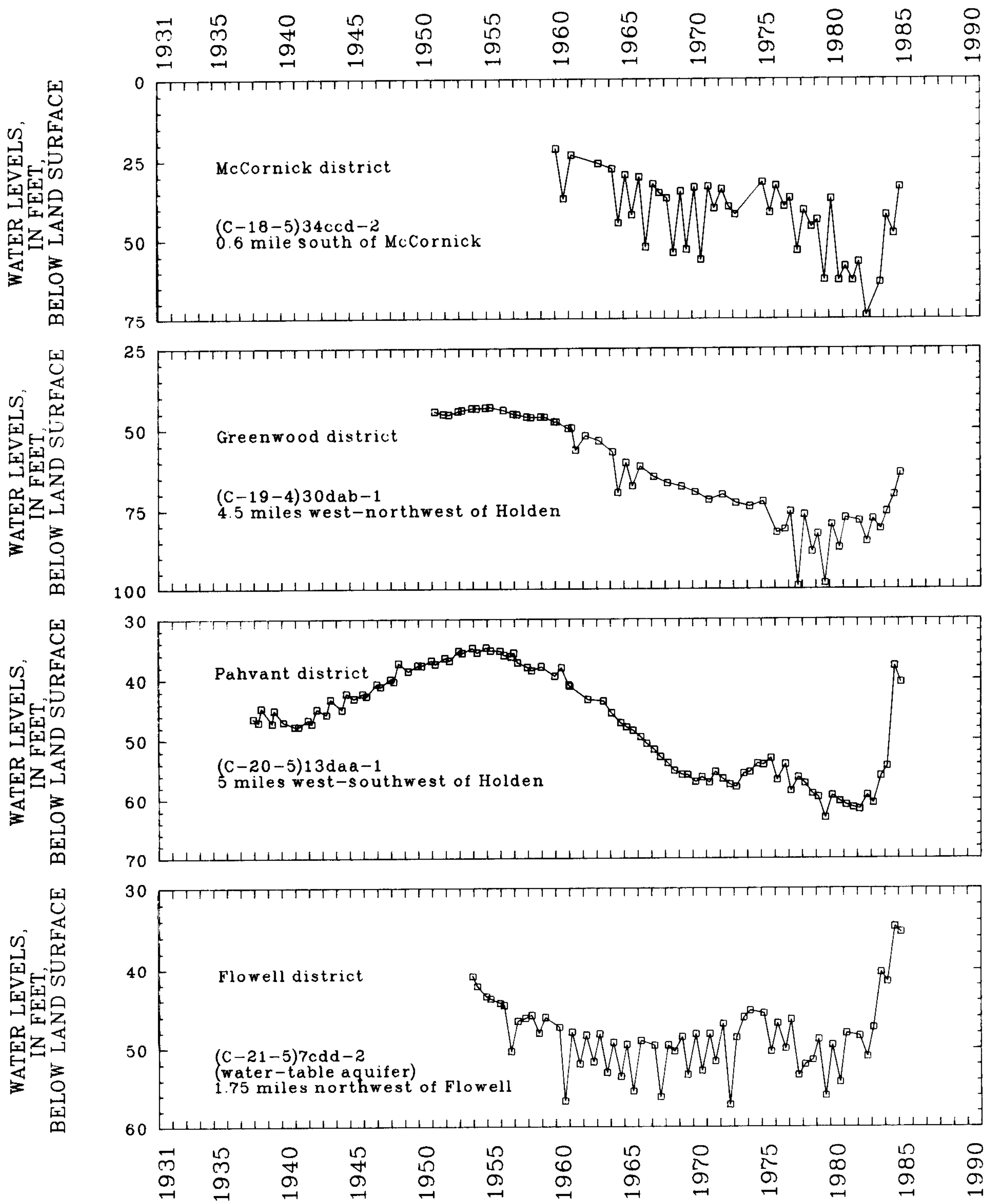

Figure 27.—Relation of water levels in selected wells in Pahvant Valley to cumulative departure from average annual precipitation at Fillmore and to annual withdrawals from wells.

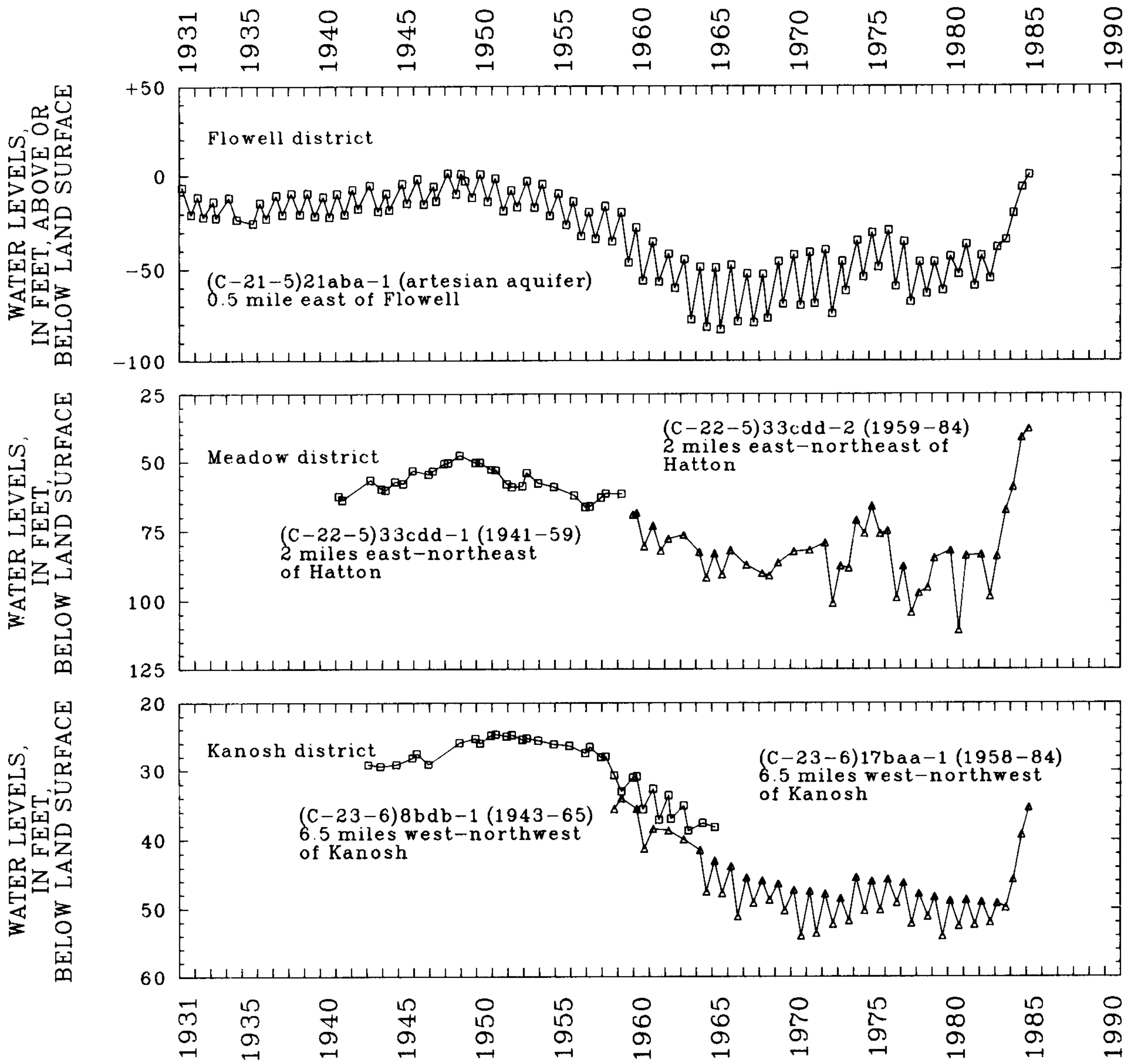

Figure 27.—Continued

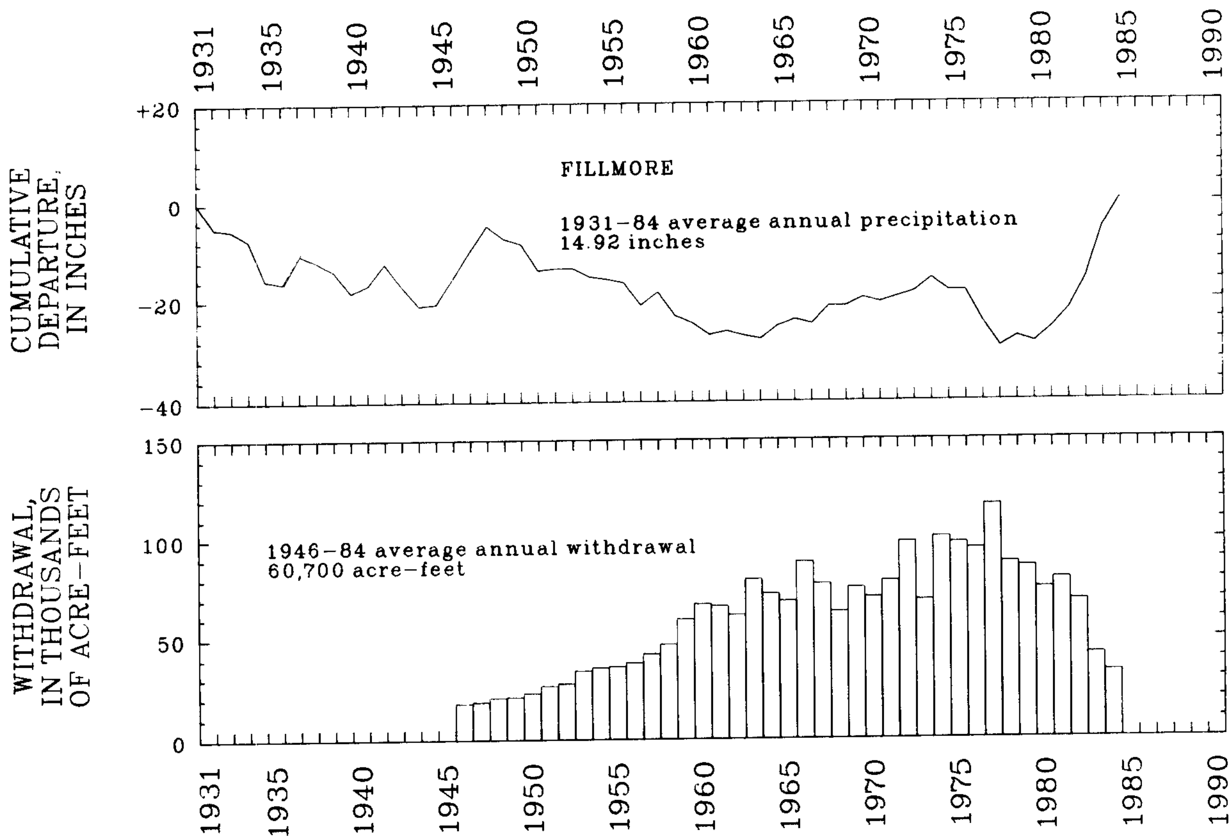

Figure 27.—Continued

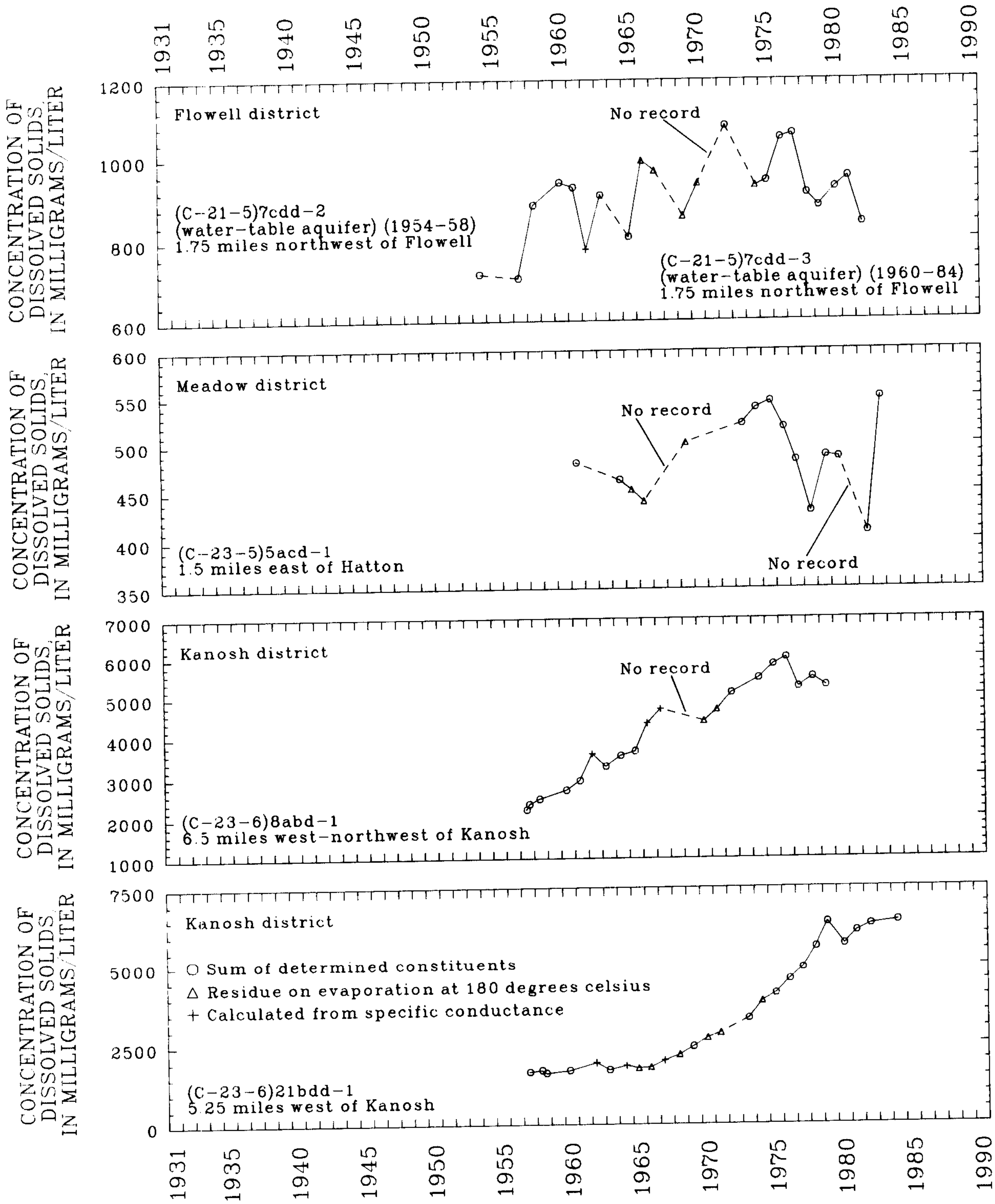

Figure 28.—Concentration of dissolved solids in water from selected wells in Pahvant Valley.

CEDAR CITY VALLEY

by B. A. Sether

Withdrawal of water from wells in Cedar City Valley during 1984 was about 20,000 acre-feet, which is 1,000 acre-feet less than 1983 and 12,000 acre-feet less than the average annual withdrawal for 1974-83 (table 2). From 1983 to 1984, withdrawal for public supply declined while withdrawals for other uses remained about the same.

Water levels rose in most of the valley from March 1984 to March 1985 (fig. 29). The water level in well (C-35-11)33aac-1 northwest of Cedar City, where water from Coal Creek was used for irrigation, rose to predevelopment levels. The largest measured rises, more than 8 feet, occurred in this area. Farther out in the valley, less water was available from Coal Creek for irrigation and recharge; thus, rises were smaller. In the northern part of the valley declines of 2 to 4 feet were measured near Rush Lake and in a small area north of Enoch. Declines of 3 feet and less were measured around Kanaraville in the southern part of the valley.

The relation of water levels in well (C-35-11)33aac-1 to precipitation at Cedar City Airport, discharge of Coal Creek, and annual withdrawals of water from wells is shown in figure 30. Discharge from Coal Creek was 29,500 acre-feet in 1984, 34,400 acre-feet less than in 1983, and 5,500 acre-feet more than the average annual discharge for 1939-84.

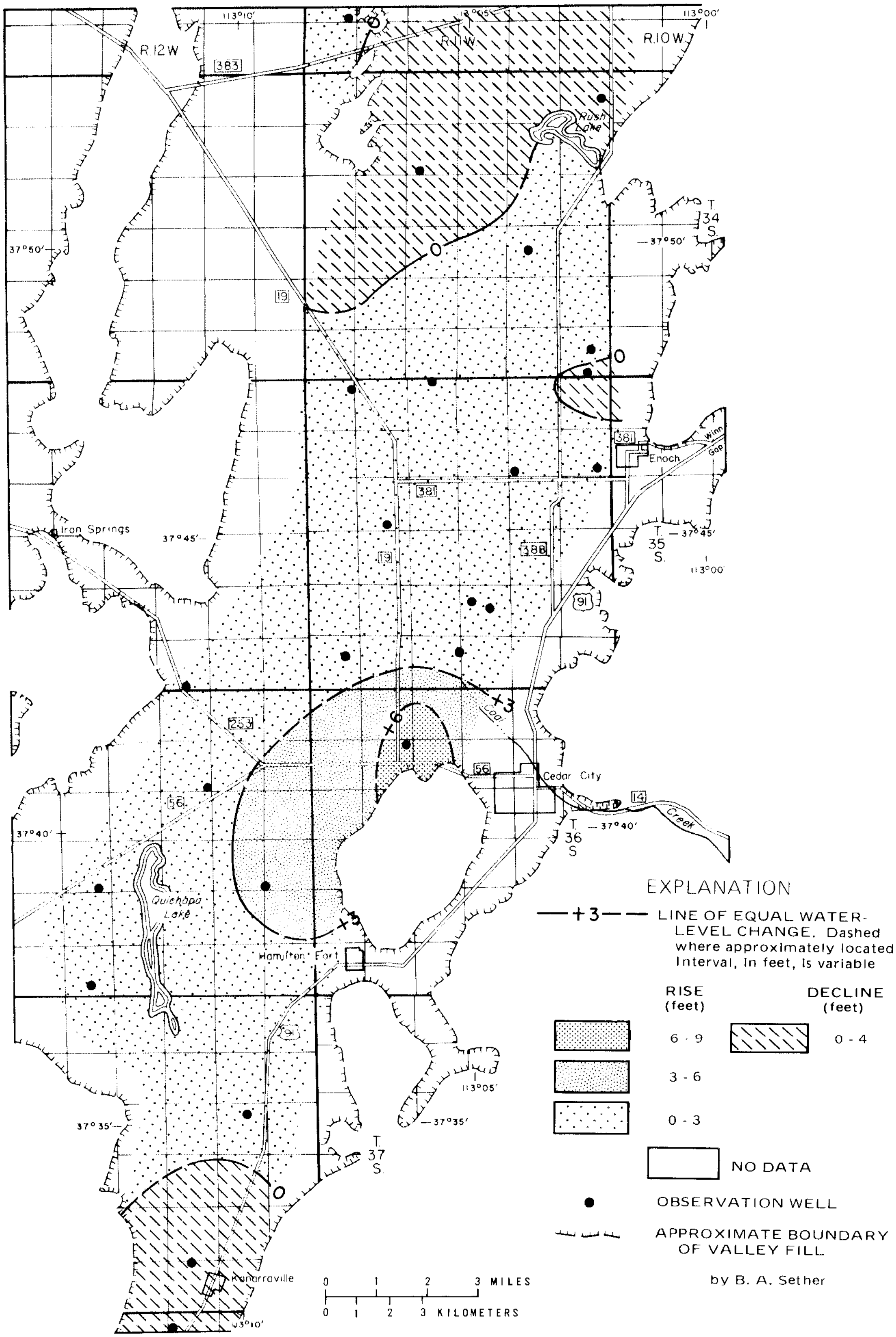

Figure 29.—Map of Cedar City Valley showing change of water levels from March 1984 to March 1985.

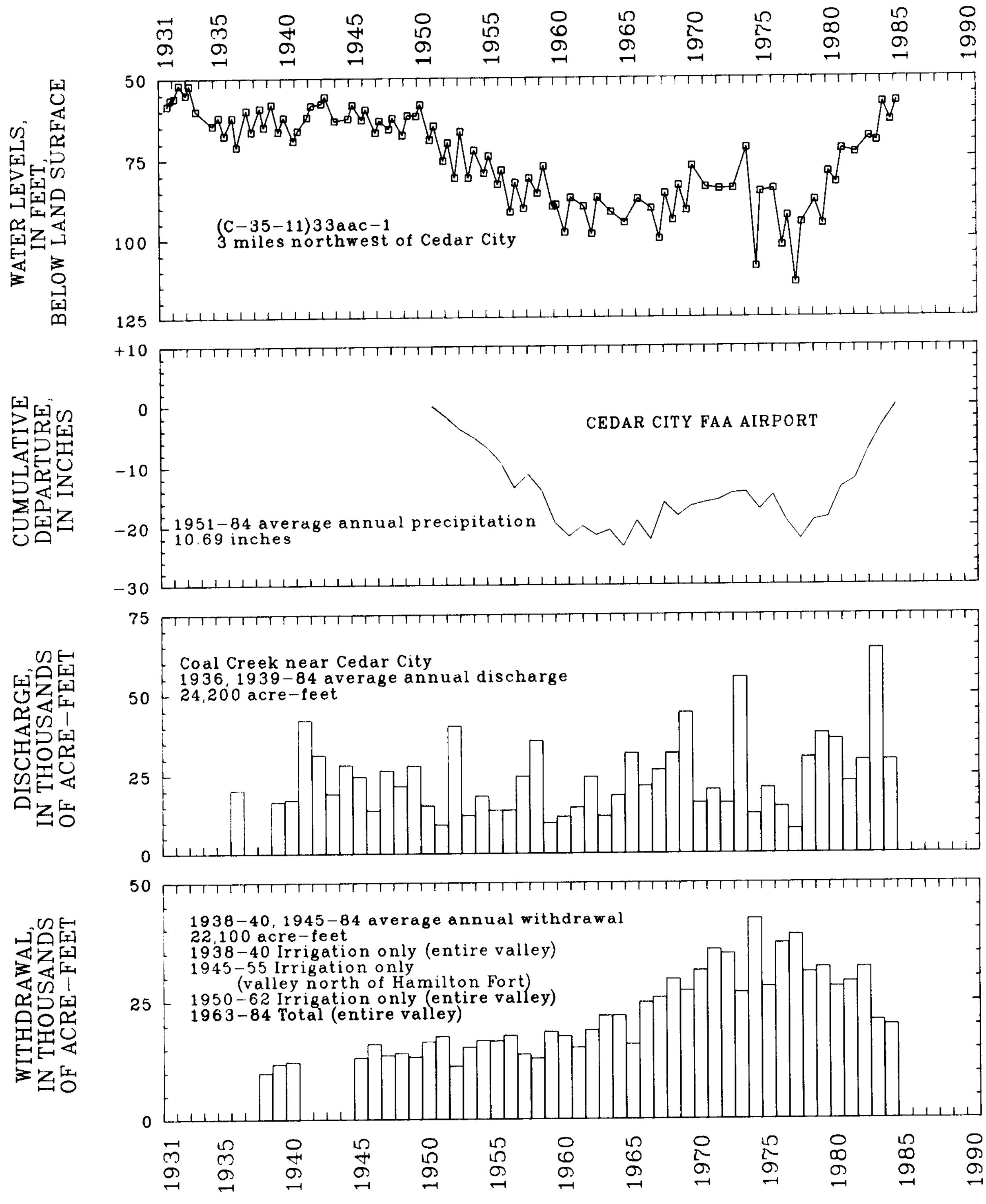

Figure 30.—Relation of water levels in well (C-35-11)33aac-1 in Cedar City Valley to cumulative departure from the average annual precipitation at the Cedar City FAA Airport, to discharge of Coal Creek near Cedar City, and to annual withdrawals from wells.

PAROWAN VALLEY

By B. A. Sether

Withdrawal of water from wells in Parowan Valley was about 22,000 acre-feet in 1984. This was the same as reported for 1983 and 7,000 acre-feet less than the average annual withdrawal for 1974-83 (table 2). Withdrawals for irrigation declined slightly while withdrawals for other uses remained about the same.

Water levels from March 1984 to March 1985 rose throughout the valley with no recorded declines (fig. 31). The largest rise, near Summit, was more than 12 feet. The rises throughout the valley were primarily due to above-average recharge from streamflow.

The relation of water levels in well (C-34-8)5bca-1 to annual withdrawals from wells and cumulative departure from the average annual precipitation at Parowan Airport is shown in figure 32. The water level in well (C-34-8)5bca-1 rose due to above-average precipitation and an increase in recharge from streamflow.

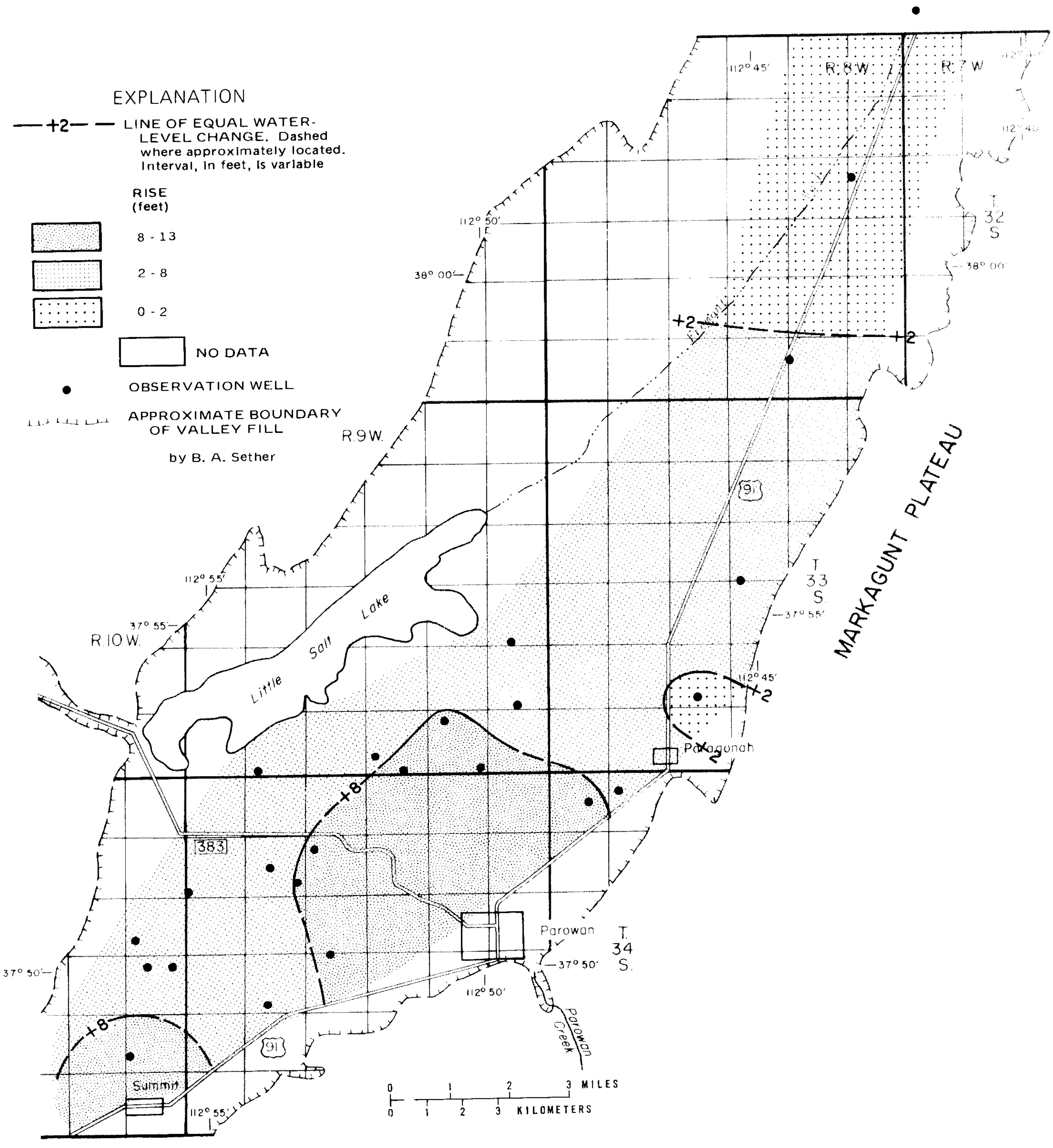

Figure 31.—Map of Parowan Valley showing change of water levels from March 1984 to March 1985.

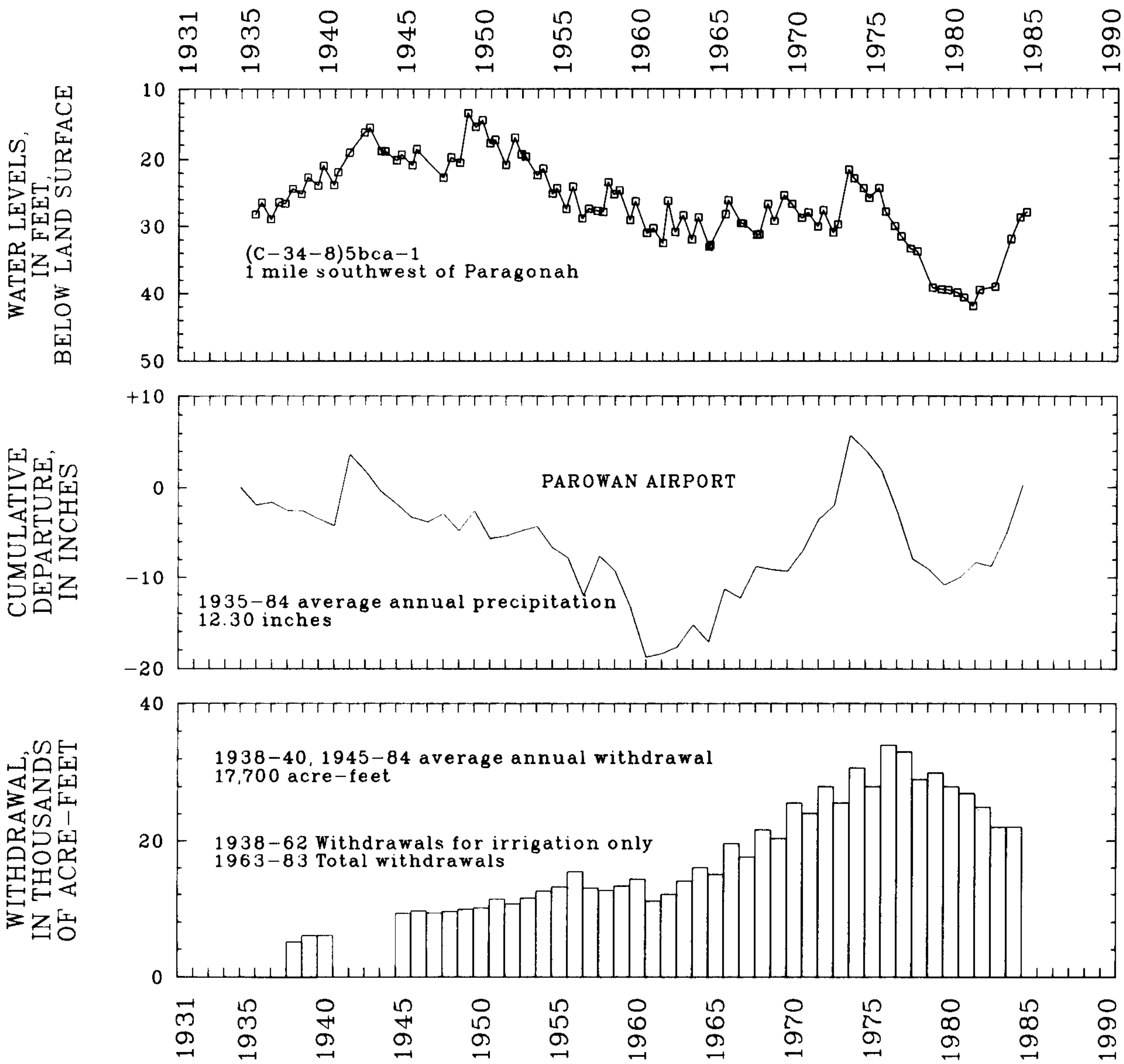

Figure 32.—Relation of water levels in well (C-34-8)5bca-1 in Parowan Valley to cumulative departure from the average annual precipitation at Parowan Airport and to annual withdrawals from wells.

ESCALANTE VALLEY

Milford area

by M. R. Eckenwiler

Withdrawal of water from wells in the Milford area in 1984 was about 32,000 acre-feet, 7,000 acre-feet less than the 1983 withdrawal, and 27,000 acre-feet less than the 1974-83 average annual withdrawal (table 2). The decrease was due to decreased ground-water withdrawals for irrigation because continued high flows in the Beaver River were adequate for irrigation.

Water levels from March 1984 to March 1985 rose in most of the area with some local declines (fig. 33). Rises of slightly more than 11 feet were observed in the area south of Milford where Beaver River water was most abundant for irrigation. Discharge from the Beaver River was 94,800 acre-feet in 1984, 30,500 acre-feet less than the previous year, and 65,600 acre-feet more than the 1931-84 average annual discharge. The Beaver River is usually dry north of Minersville, however, high flows during the last two years have caused the river to flow farther north and spread out in the desert area up to 20 miles north of Milford. The relation of water levels in well (C-29-10)6ddc-2 to precipitation at Milford Airport, discharge of the Beaver River at Rocky Ford Dam, and annual withdrawals of water from wells is shown in Figure 34.

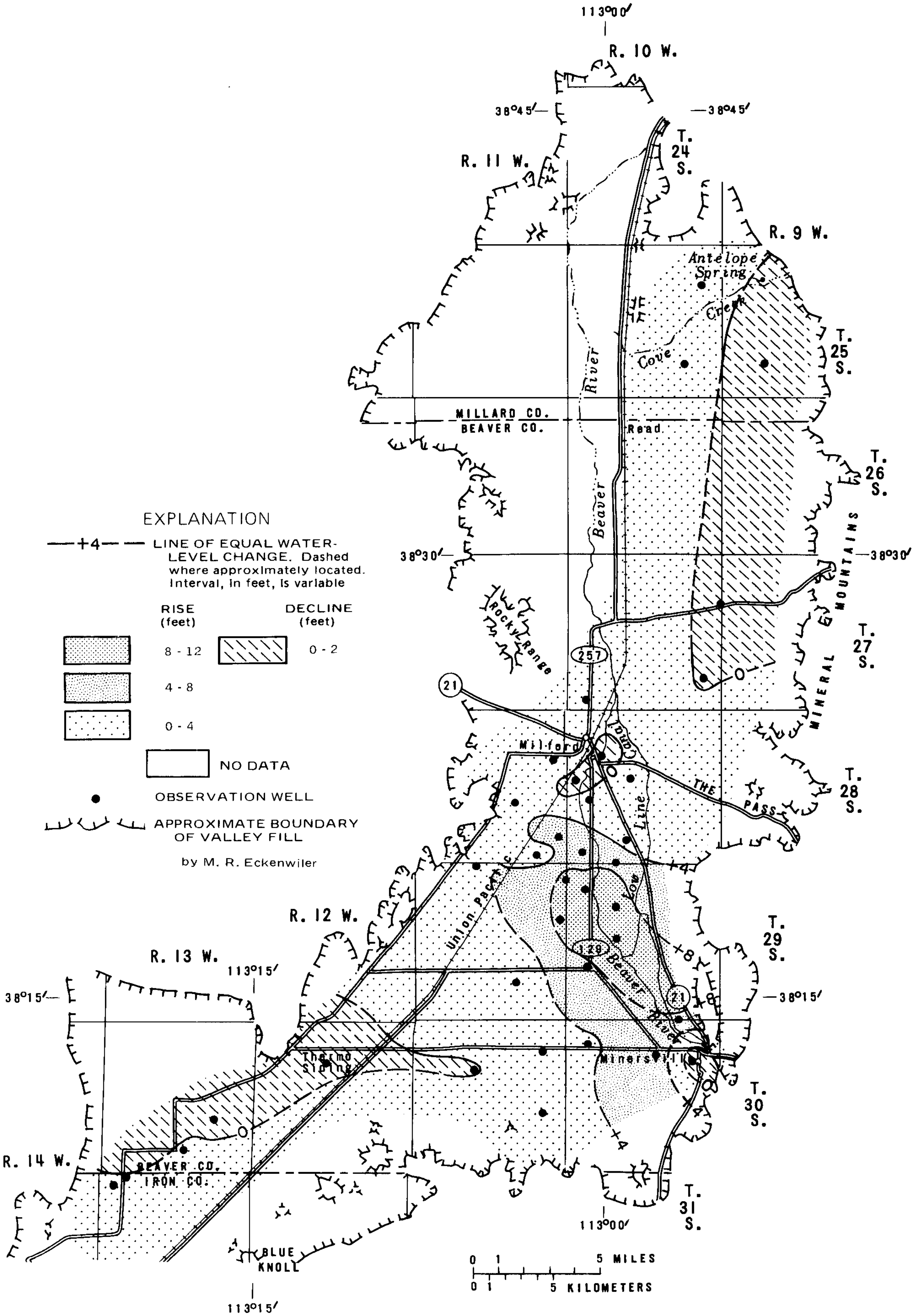

Figure 33.—Map of the Milford area showing change of water levels from March 1984 to March 1985.

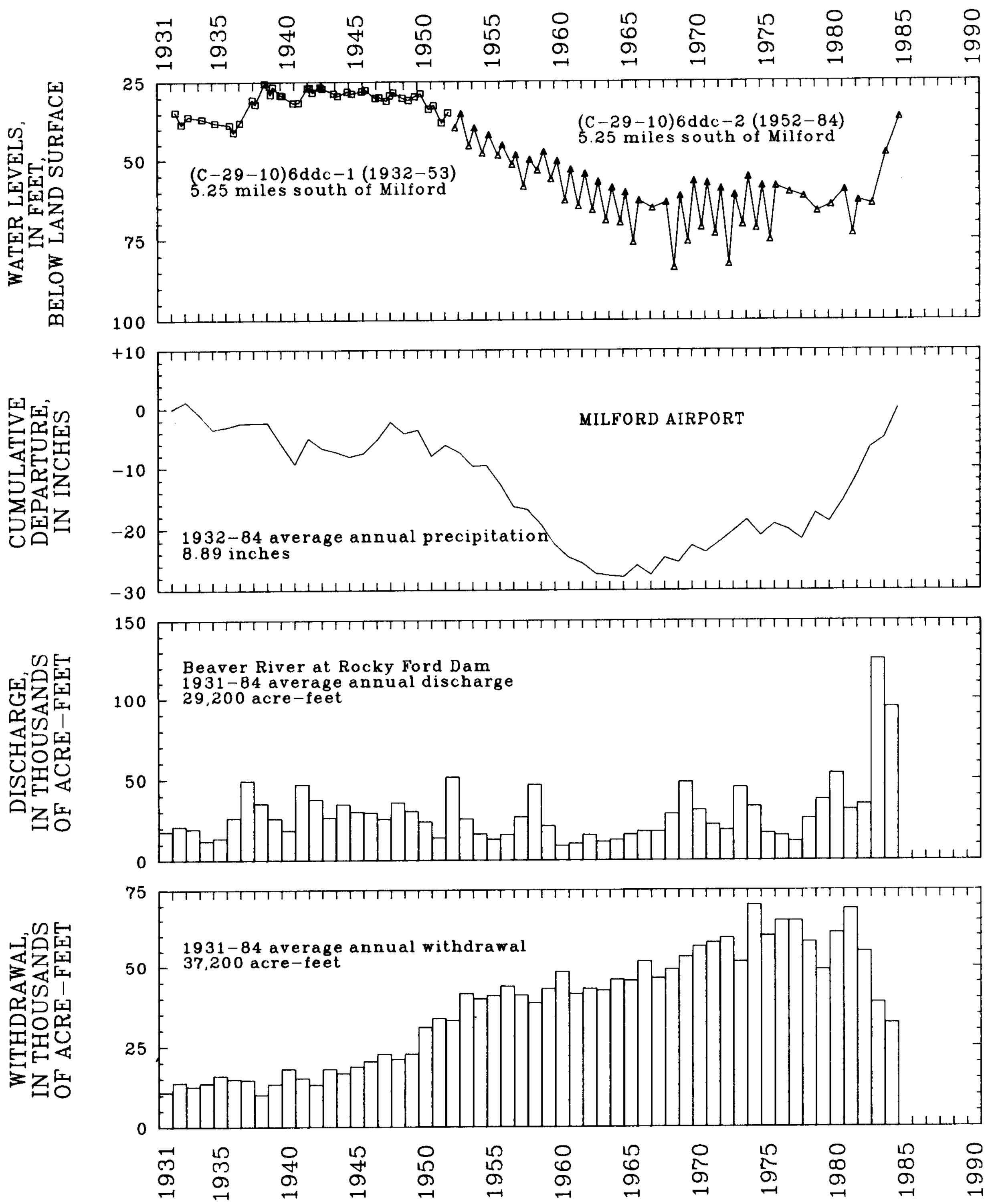

Figure 34.—Relation of water levels in well (C-29-10)6ddc-2 in the Milford Area, to cumulative departure from the average annual precipitation at Milford Airport, to discharge of the Beaver River at Rocky Ford Dam, and to annual withdrawals from wells.

Beryl-Enterprise area

By G. W. Sandberg

Withdrawal of water from wells in the Beryl-Enterprise area in 1984 was about 95,000 acre-feet, an increase of 9,000 acre-feet from 1983 and 11,000 acre-feet more than the average annual withdrawal for 1974-83 (table 2). The increase was primarly due to increased withdrawals for dewatering a mine area.

Water levels declined from March 1984 to March 1985 in most of the area (fig. 35) because of continued large withdrawals. Water levels rose slightly in the northeastern part of the area where very little ground water is withdrawn. Water that was pumped to dewater a mine and then spread on a nearby area for recharge may have decreased the amount of decline southwest of Beryl Junction.

The relation of water levels in well (C-35-17)25dcd-1 to annual withdrawal from wells and cumulative departure from the average annual precipitation at Modena is shown in figure 36, and variations of dissolved-solids concentrations in water from selected wells are shown in figure 37. Concentration of dissolved solids in well (C-34-16)28dcc-2 (the only well sampled in 1984) in the northern part of the pumped area remained about the same as in 1983.

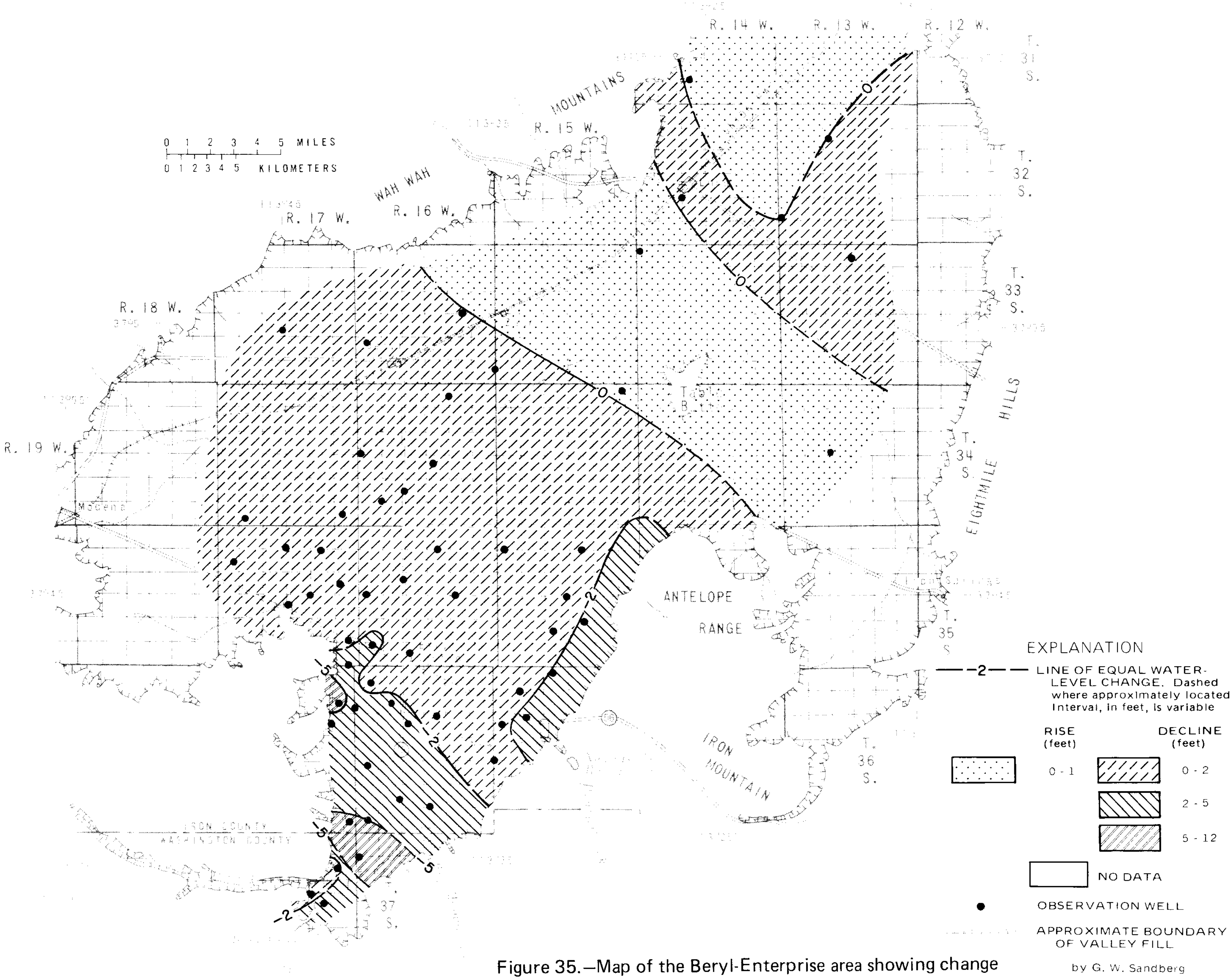

Figure 35.—Map of the Beryl-Enterprise area showing change of water levels from March 1984 to March 1985.

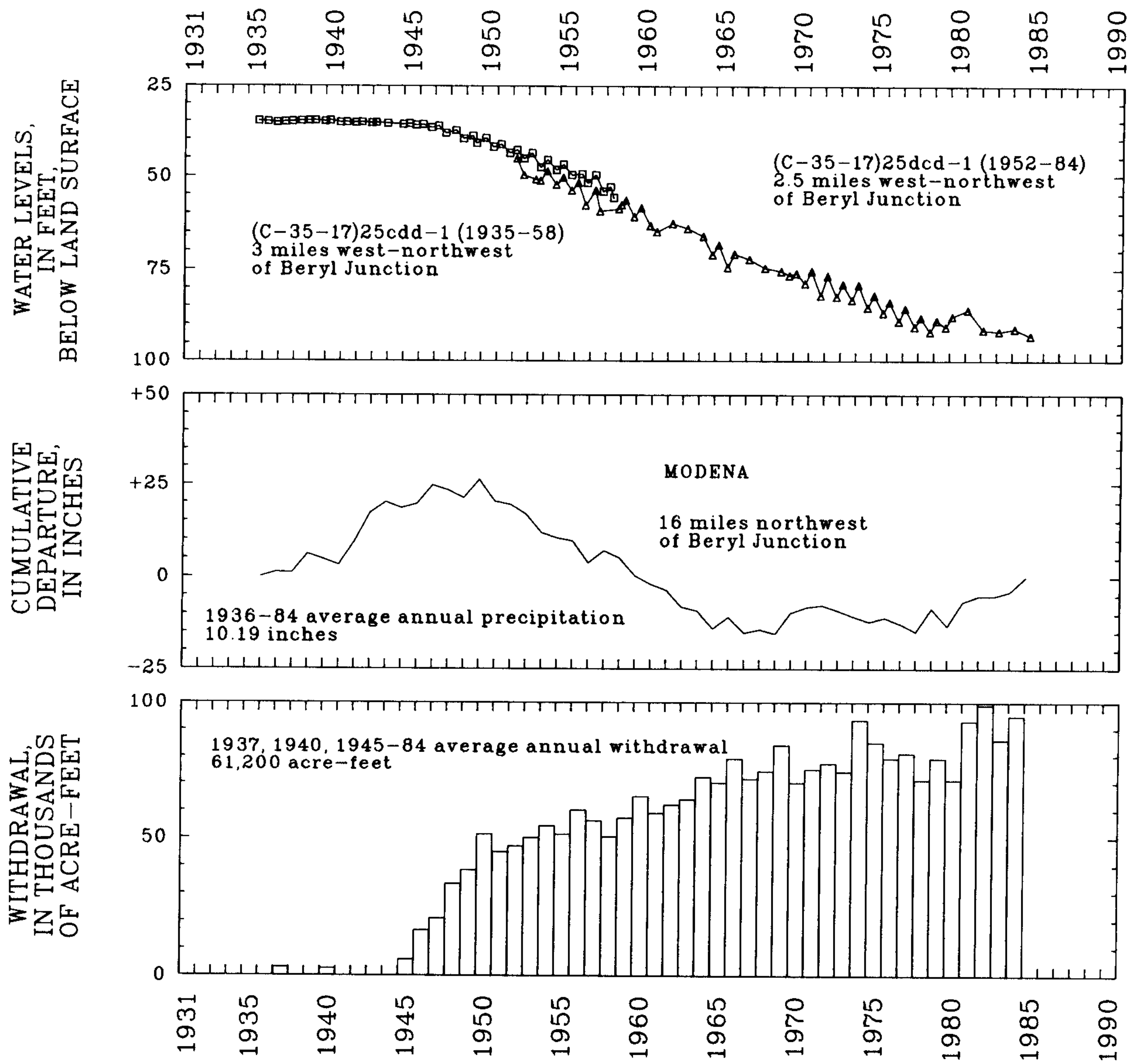

Figure 36.—Relation of water levels in well (C-35-17)25dcd-1 in the Beryl-Enterprise area to cumulative departure from the average annual precipitation at Modena and to annual withdrawals from wells.

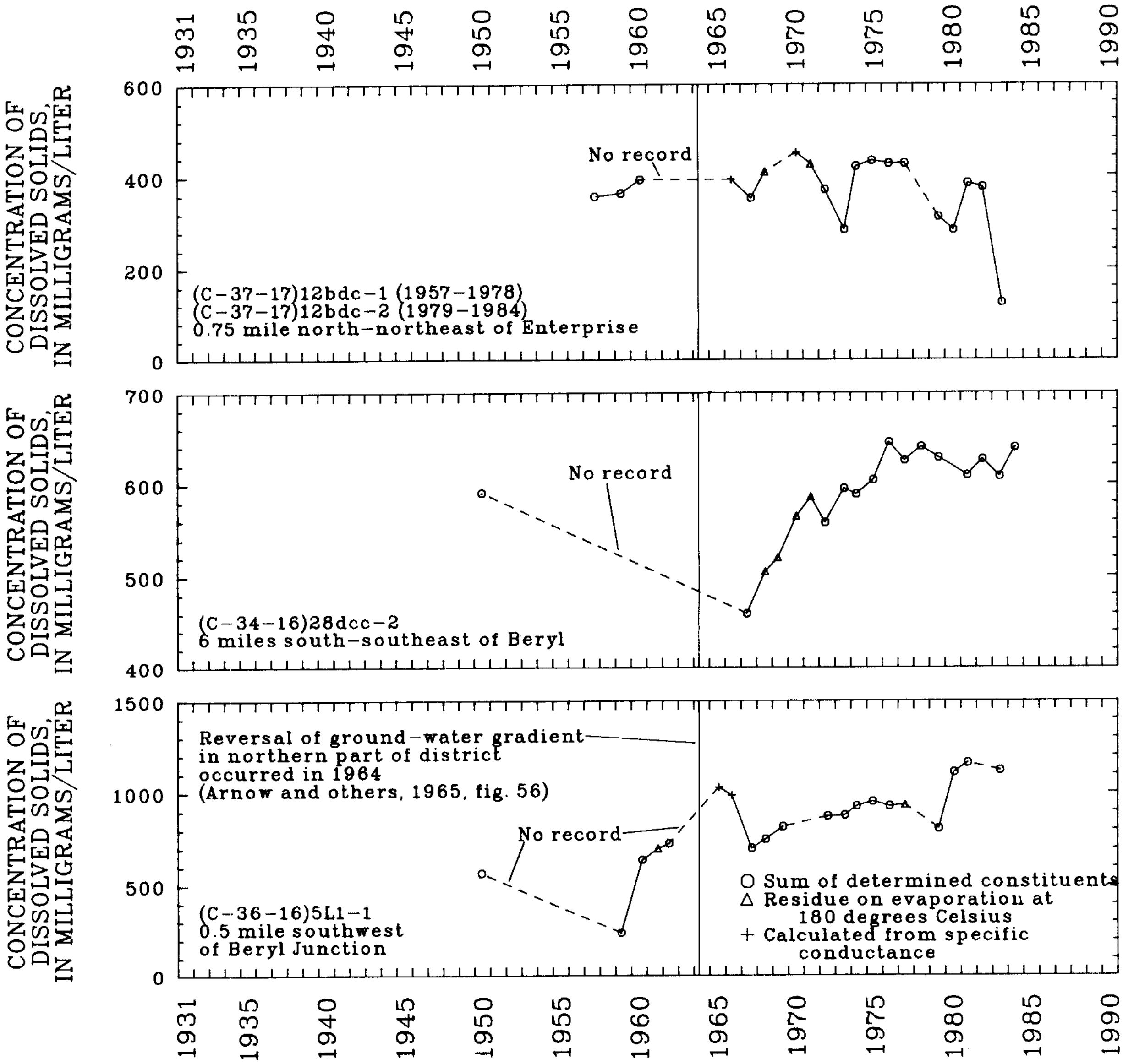

Figure 37.—Concentration of dissolved solids in water from selected wells in the Beryl–Enterprise area.

CENTRAL VIRGIN RIVER AREA

by G. W. Sandberg

Withdrawal of water from wells in the Central Virgin River area was approximately 19,000 acre-feet in 1984, 3,000 acre-feet more than in 1983, and the same as the 1974-83 average annual withdrawal (table 2). The 1984 withdrawal for public supply was more than double the 1983 withdrawal. Withdrawal for irrigation decreased. This is attributed to greater use of surface-water for irrigation and conversion of land from agricultural to urban use. The increased withdrawal for public supply is attributed to less water available from springs and increased demand because of less precipitation.

Water levels declined in 14 of 17 observation wells (fig. 38). The greatest decline, 4.6 feet, occurred about 9 miles northwest of St. George and the greatest observed rise, 4.8 feet, occurred about 5 miles southeast of St. George.

The relation of water levels in selected wells to discharge of the Virgin River at Virgin, precipitation at St. George, and annual withdrawal from wells is shown in figure 39. Precipitation at Saint George was 6.66 inches and was below average for the first time in seven years.

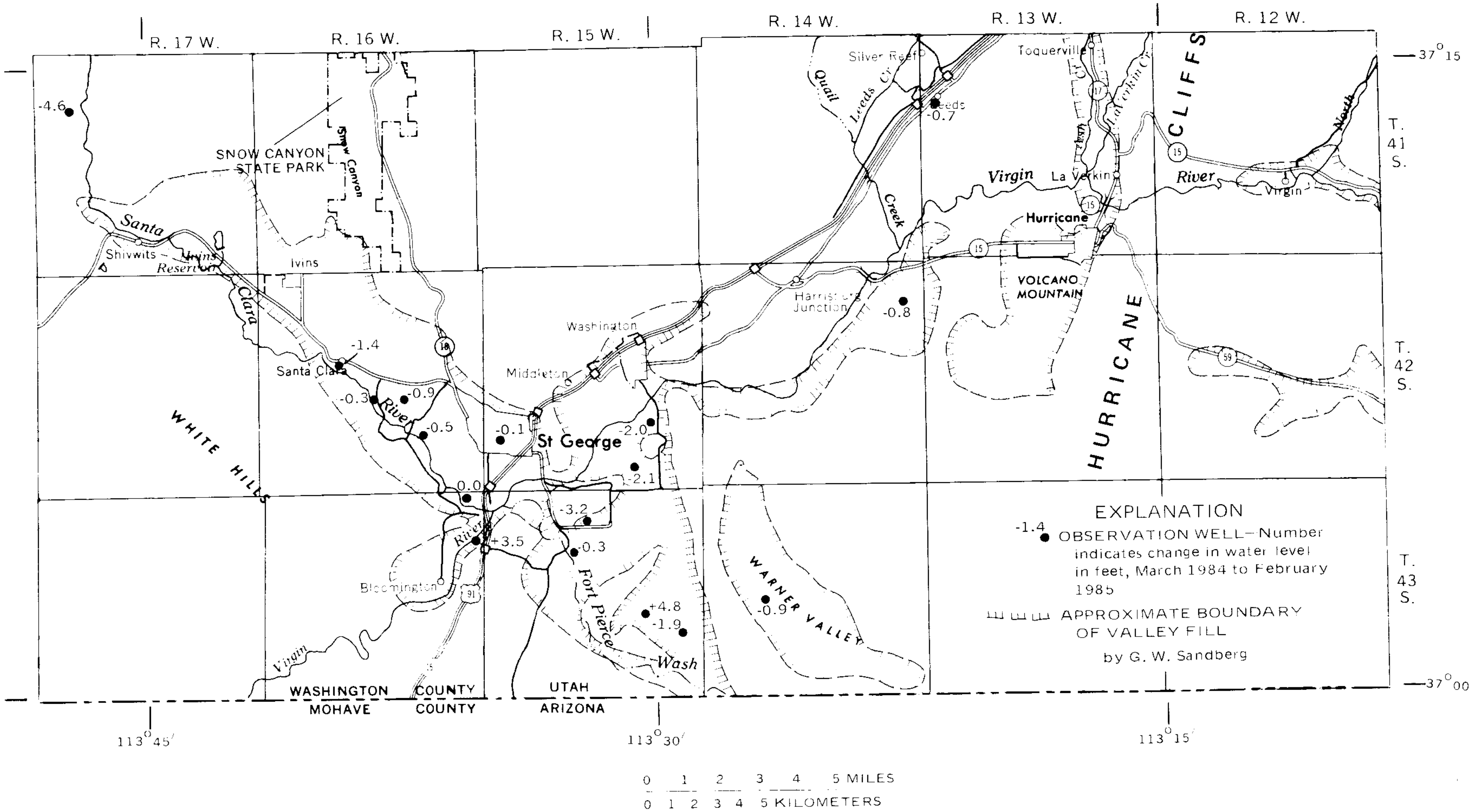

Figure 38.—Map of the Central Virgin River area showing change of water levels from March 1984 to February 1985.

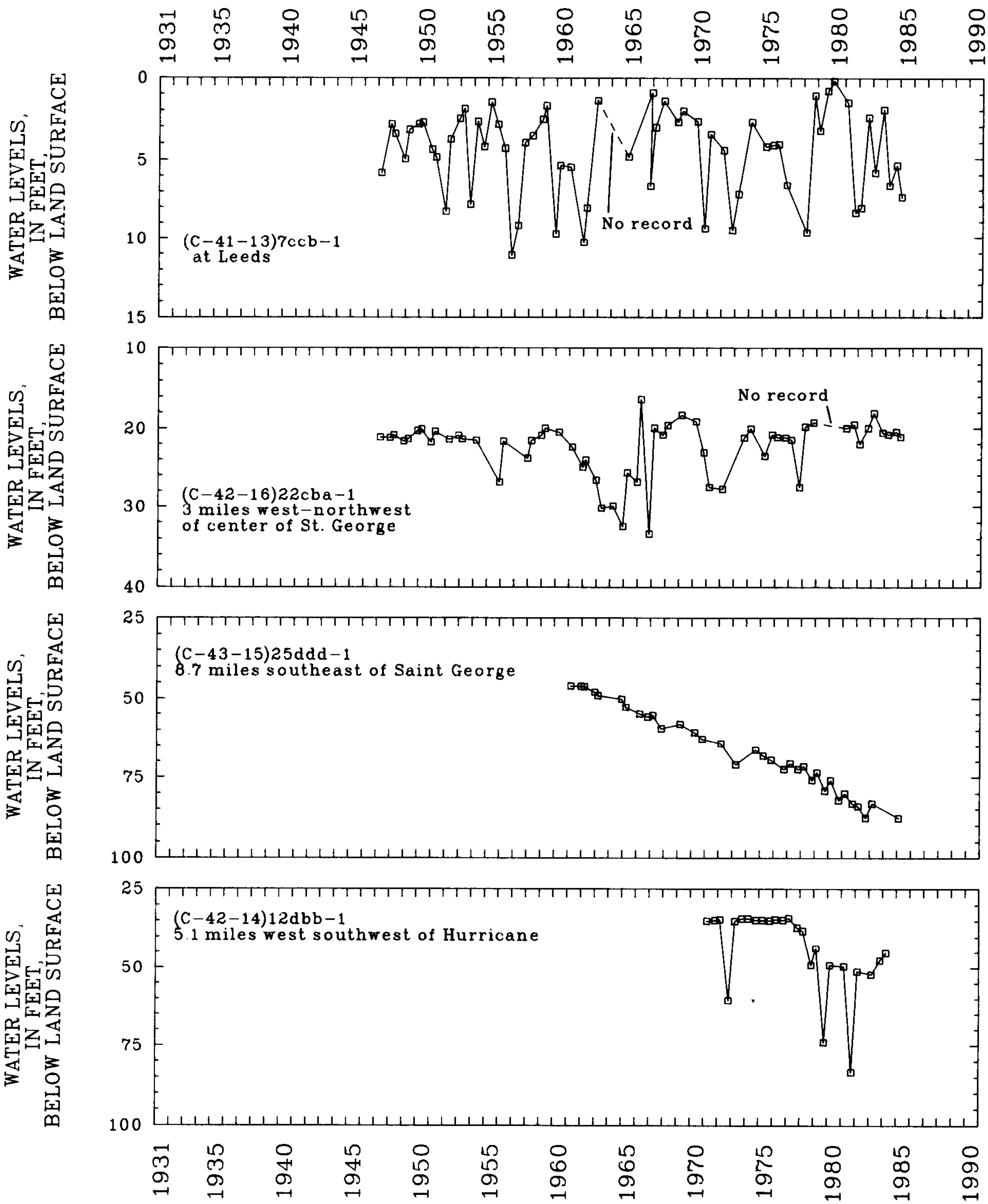

Figure 39.—Graphs showing relation of water levels in selected wells to discharge of the Virgin River at Virgin, to cumulative departure from average annual precipitation at Saint George, and to annual withdrawals from wells in the Central Virgin River area.

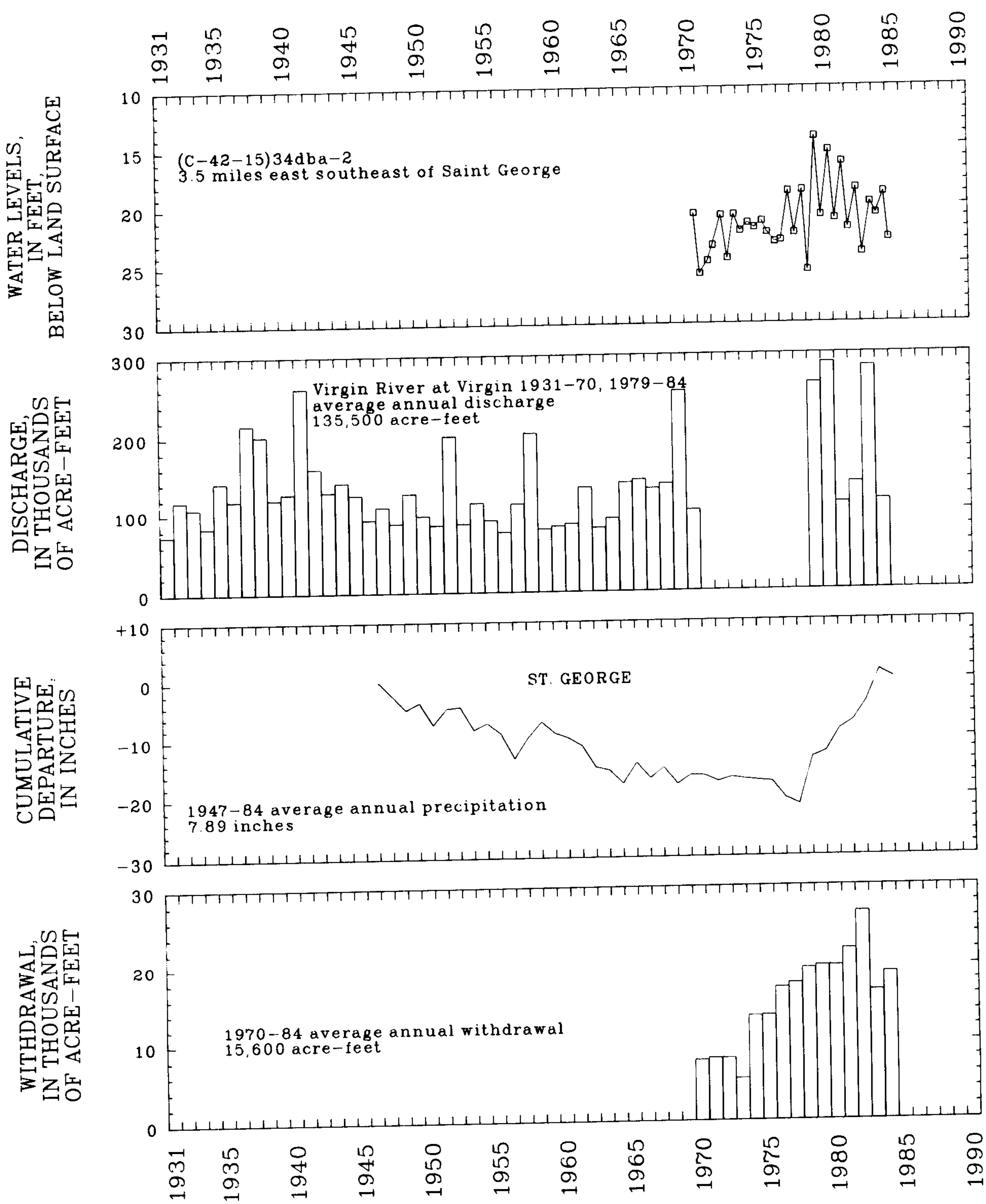

Figure 39.—Continued

OTHER AREAS

by L. R. Herbert

Approximately 64,000 acre-feet of water was withdrawn from wells in 1984 in those areas of Utah listed below:

Number in figure 1	Area	Estimated withdrawal (acre-feet) 1984	1983
1	Grouse Creek Valley	1,600	1,900
2	Park Valley	1,100	1,100
8	Ogden Valley	9,500	9,900
12	Dugway area Skull Valley Old River Bed	2,000	3,500
13	Cedar Valley	2,100	2,600
18	Sanpete Valley	6,800	6,200
23	Snake Valley	7,000	6,500
25	Beaver Valley	7,100	8,200
	Remainder of State	26,800	11,600
Total (rounded)		64,000	52,000

The total withdrawal was 12,000 acre-feet more than in 1983 and 20,000 acre-feet less than the average annual withdrawal for 1974-83 (table 2). In the areas listed, withdrawals in 1984 were generally less than in 1983, except in Snake Valley, Sanpete Valley and areas in the remainder of the state. The increase in withdrawals in the remainder of the state was mainly due to increases in irrigation and industrial use.

Figure 40 shows the relation between long-term hydrographs of 16 selected observation wells, cumulative departure from average annual precipitation at sites in or near the areas in which the wells are located, and total withdrawals from wells in "Other areas." Water levels rose in 13 of the 16 wells from March 1984 to 1985. The rises were due to above average precipitation.

Figures 41 and 42 respectively show changes of water levels in Cedar and Sanpete Valleys from March 1984 to March 1985. Water levels in both valleys generally rose, due to above average precipitation and decreased withdrawals for irrigation. Rises up to about 11 feet were recorded in Cedar Valley and about 15 feet in Sanpete Valley. Declines occurred in areas where water levels were affected by local ground-water withdrawals.

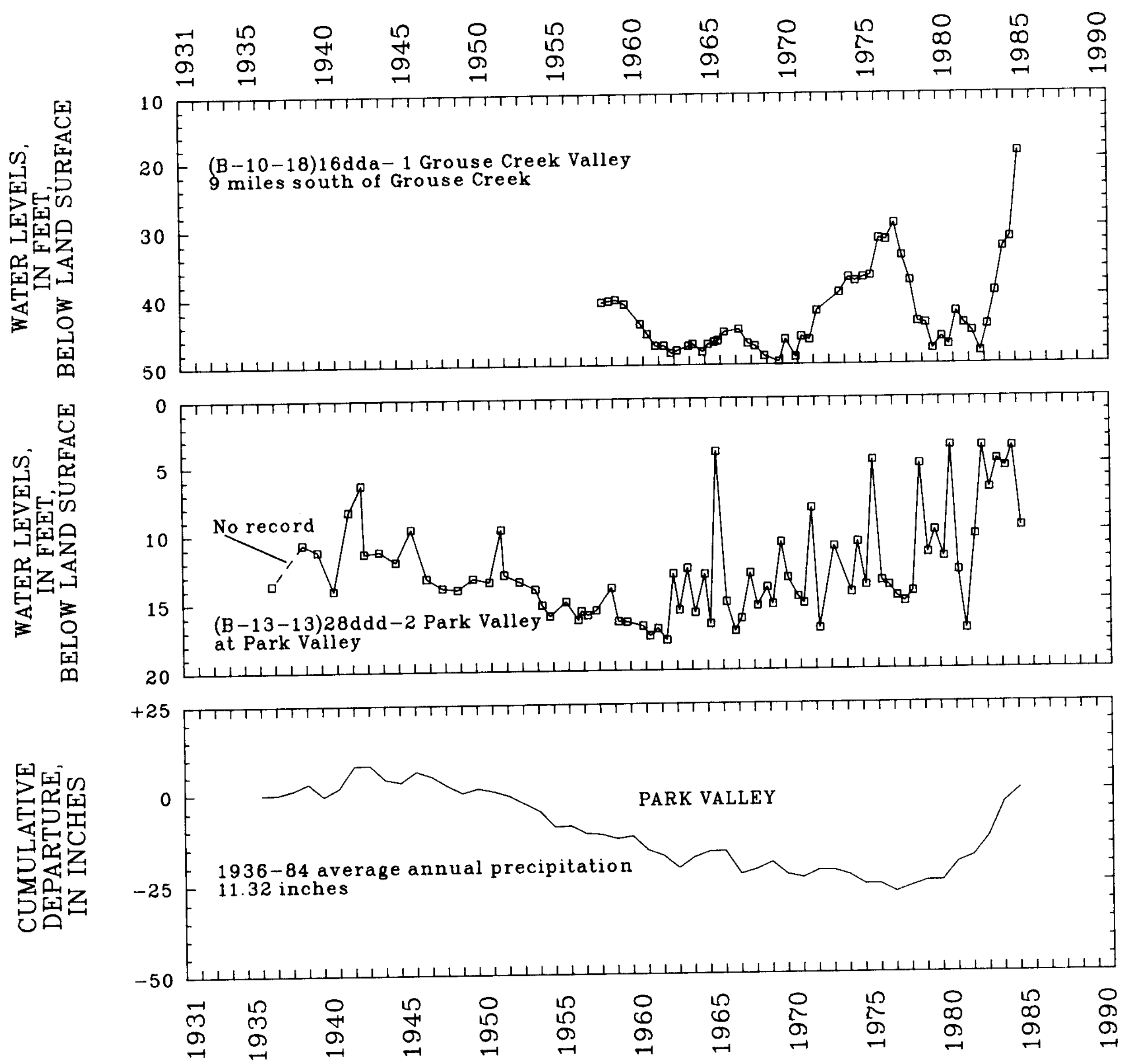

Figure 40.—Relation of water levels in wells in selected areas of Utah to cumulative departure from the average annual precipitation at sites in or near those areas, and total withdrawals from wells in "Other areas."

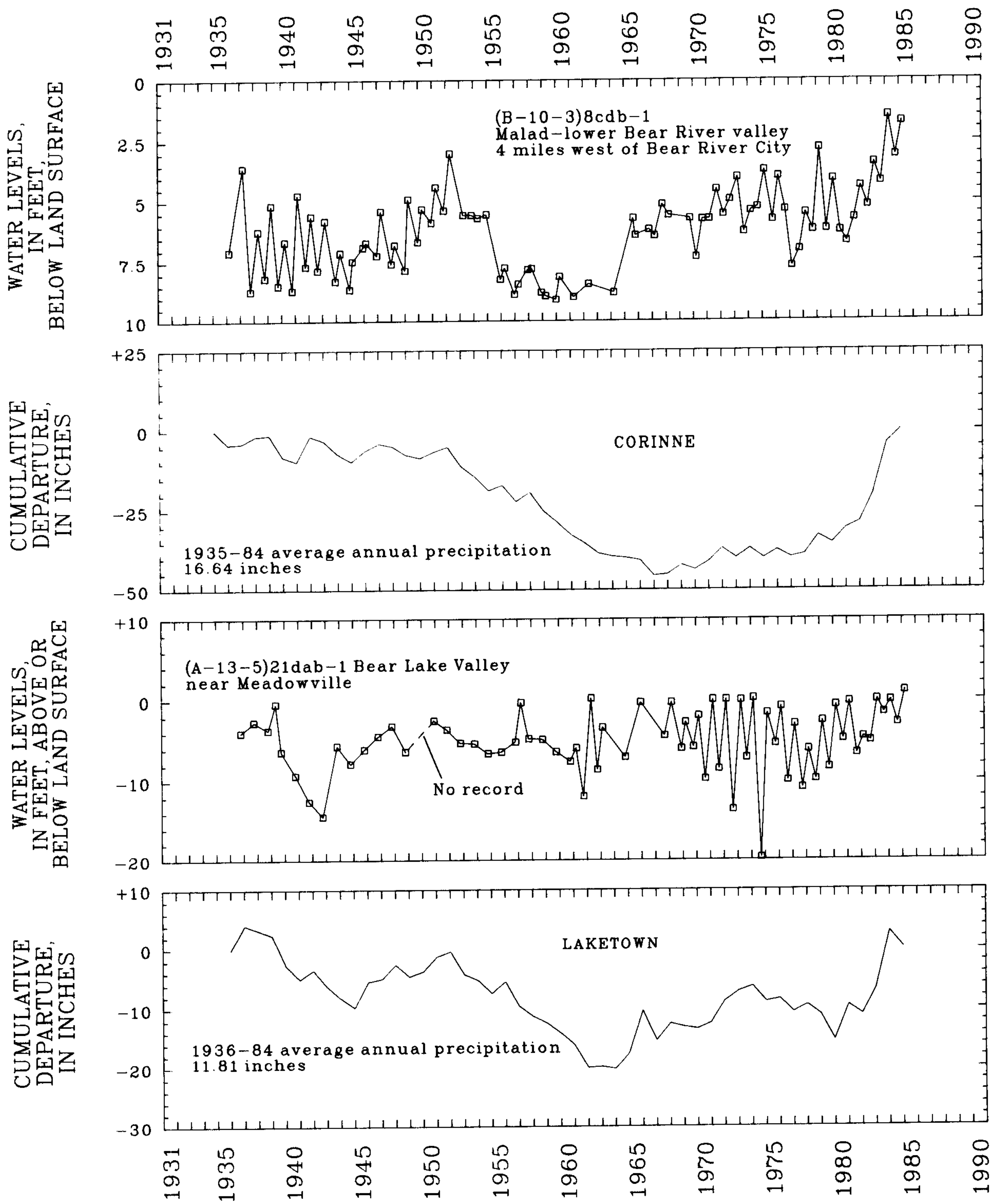

Figure 40.—Continued

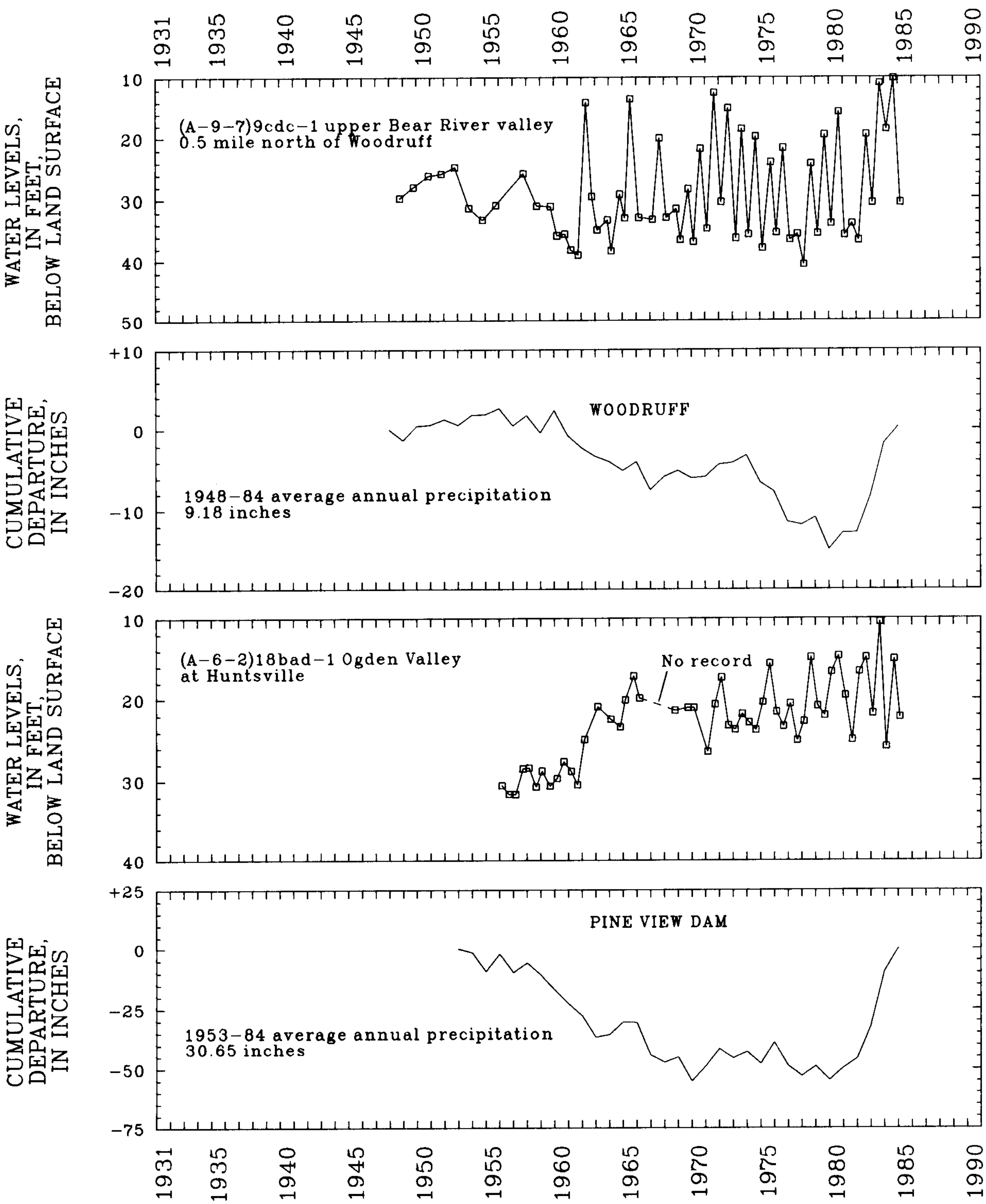

Figure 40.—Continued

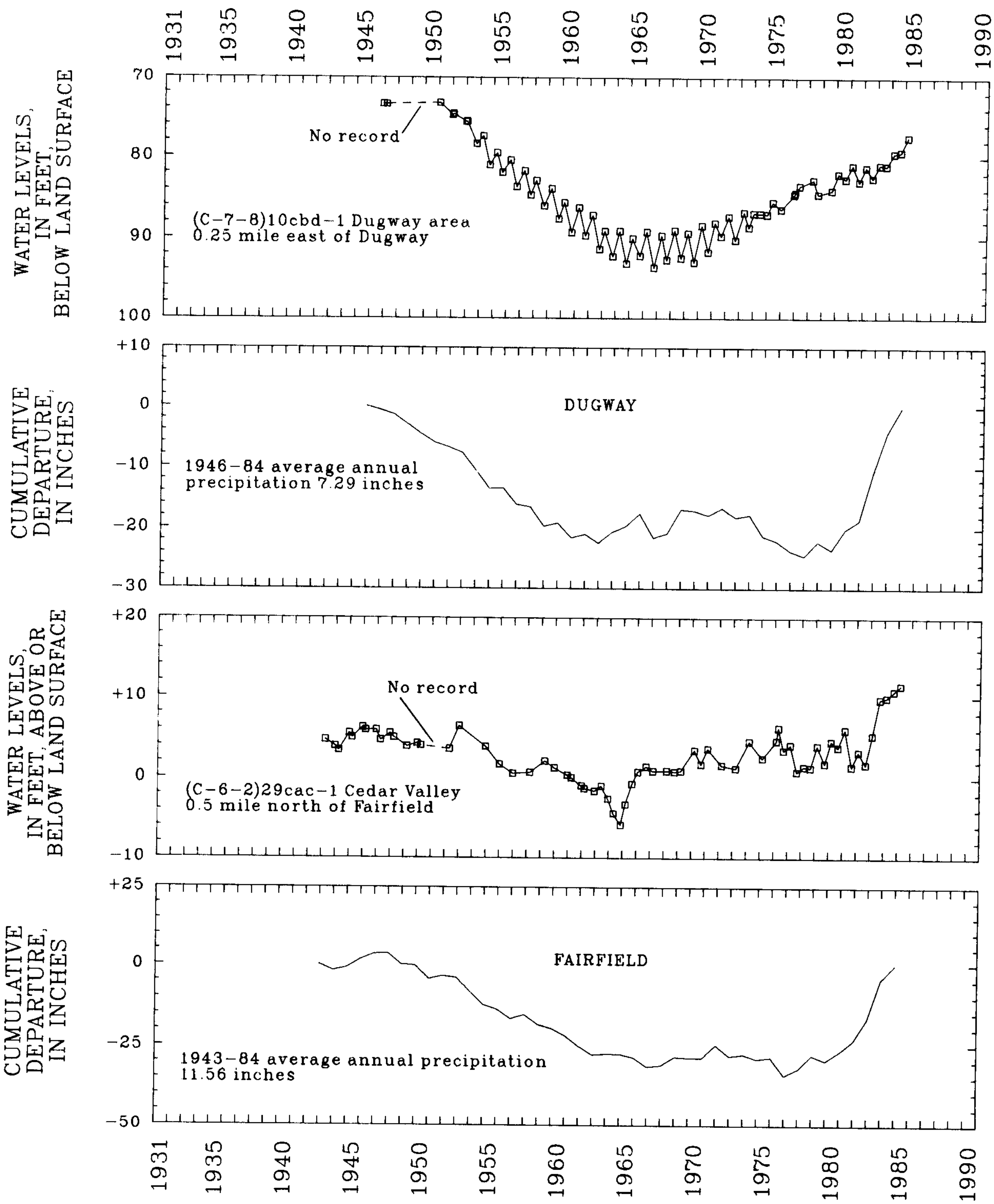

Figure 40.—Continued

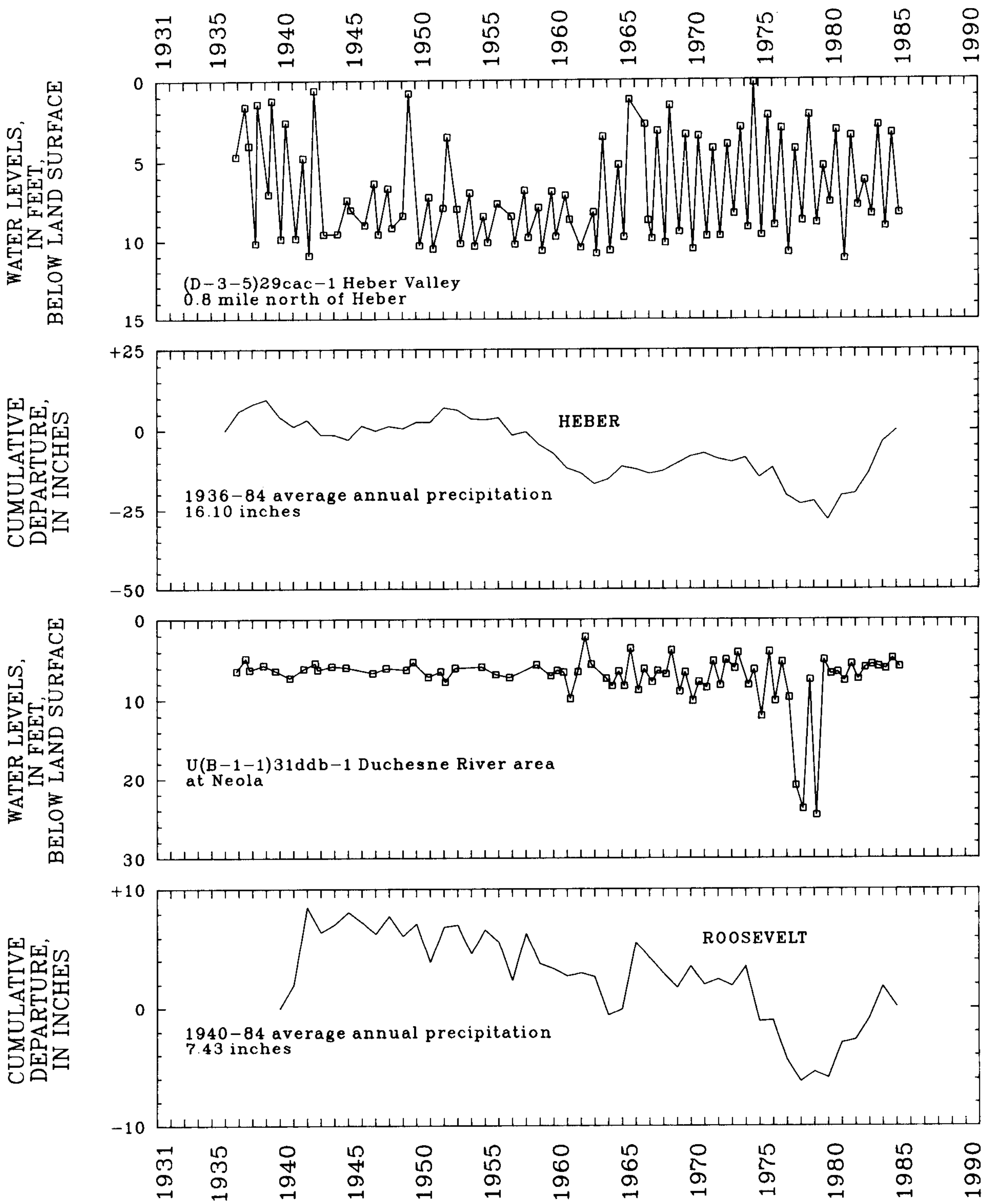

Figure 40.—Continued

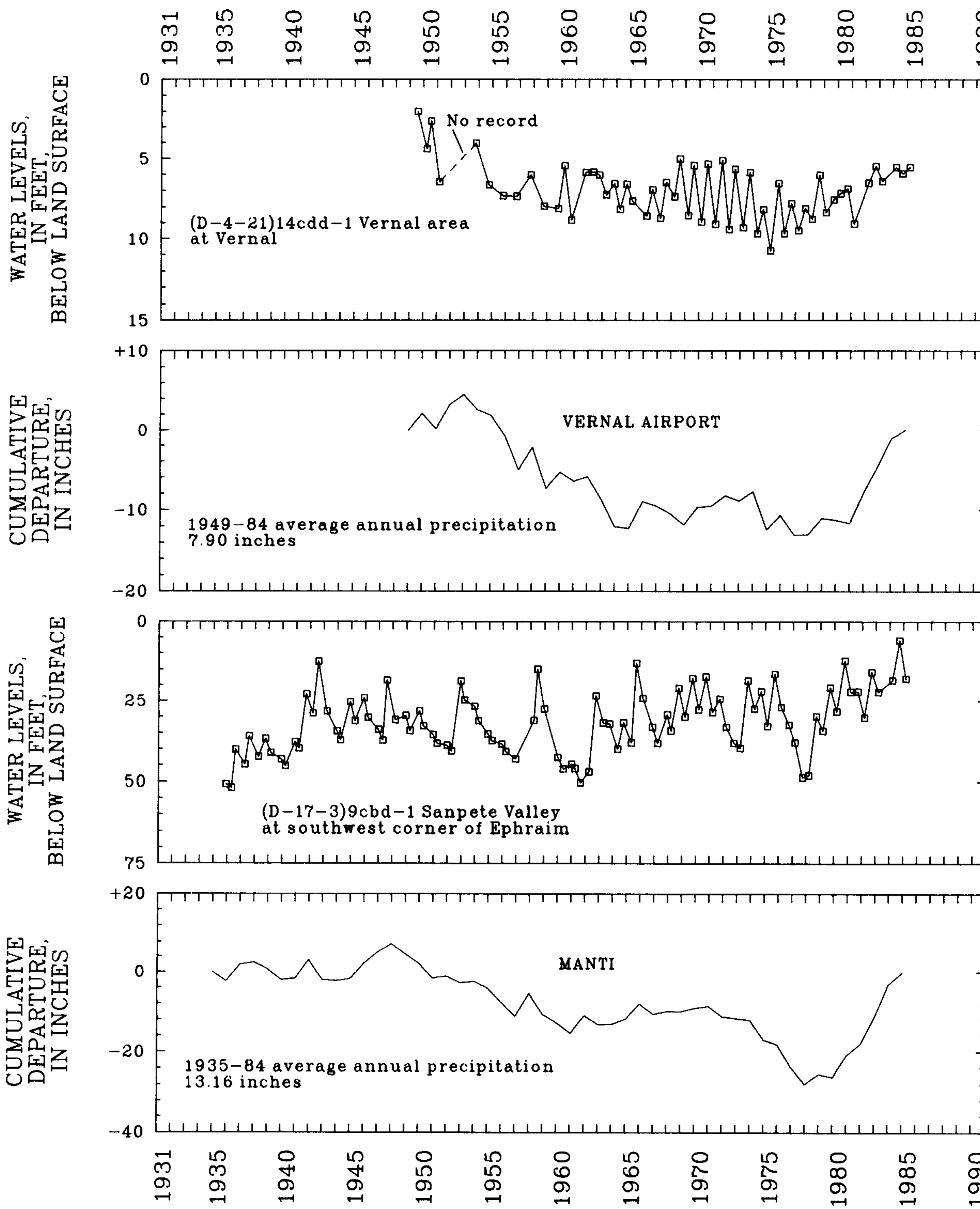

Figure 40.—Continued

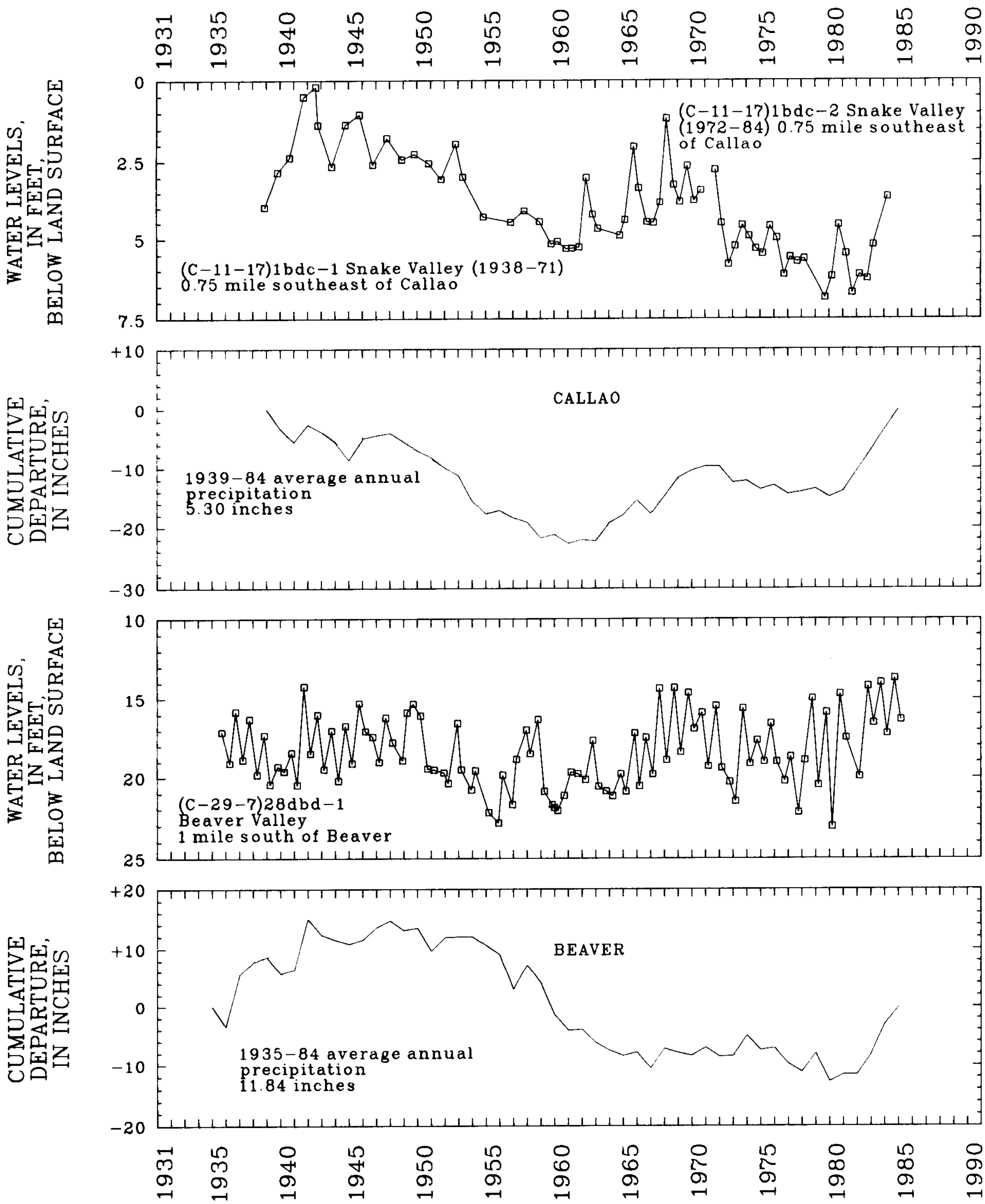

Figure 40.—Continued

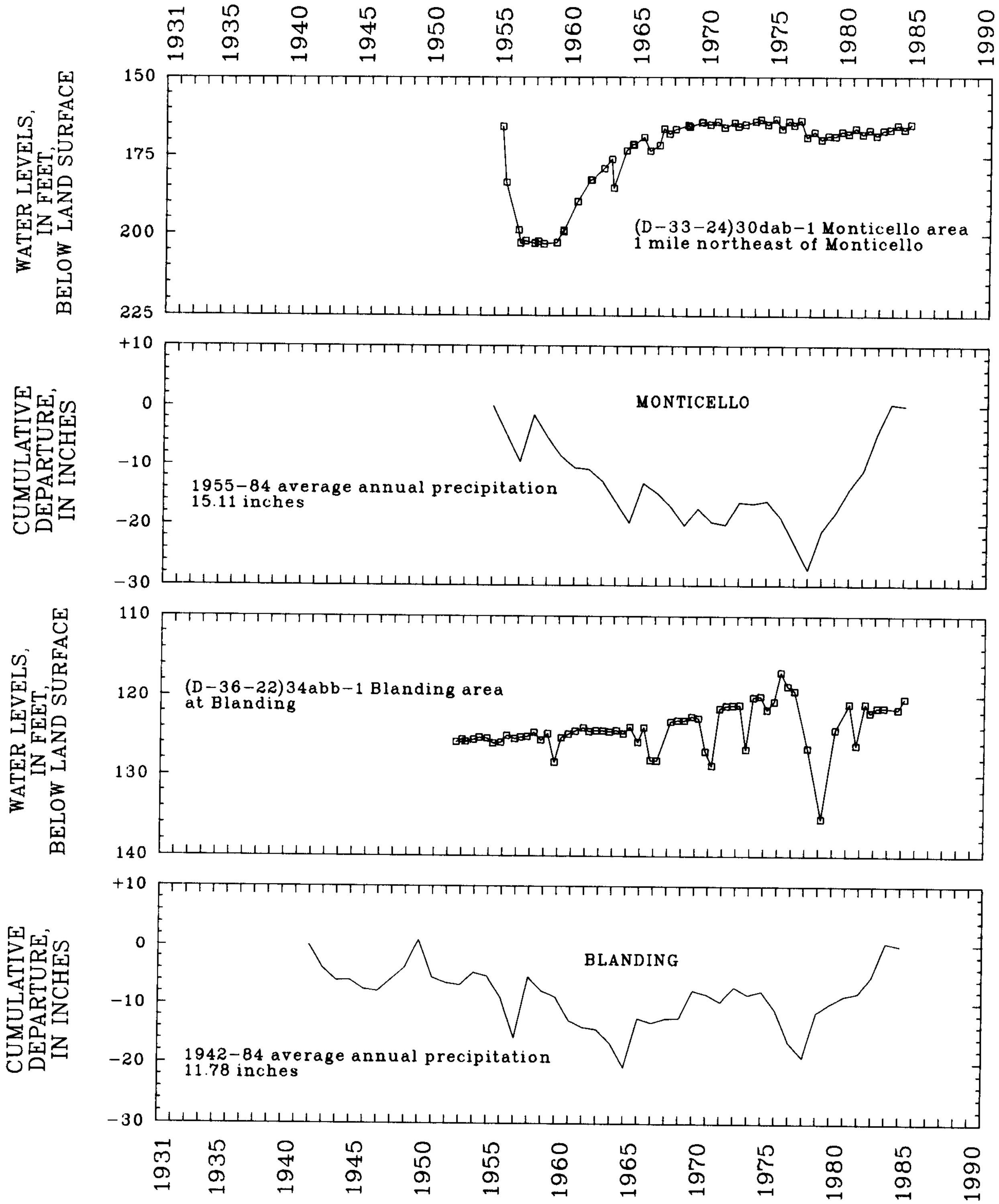

Figure 40.—Continued

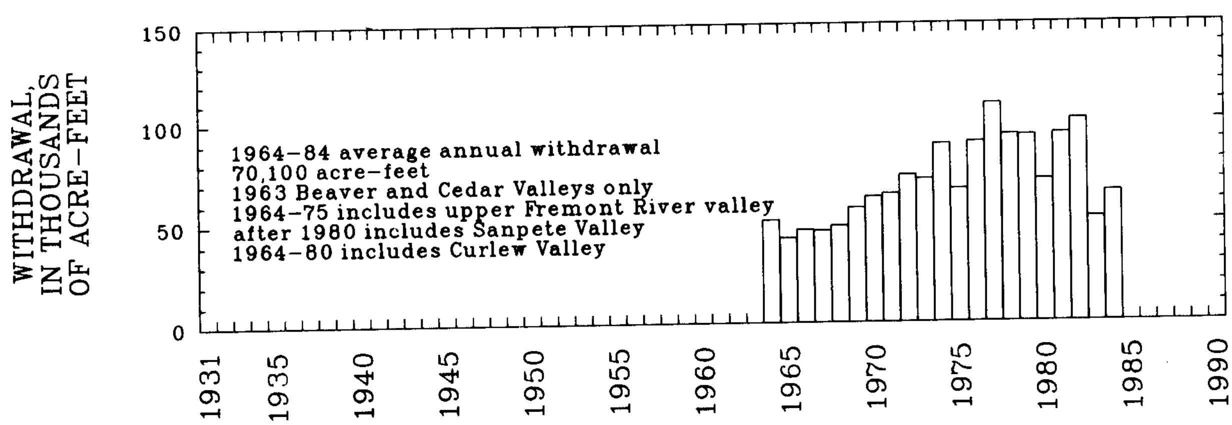

Figure 40.—Continued

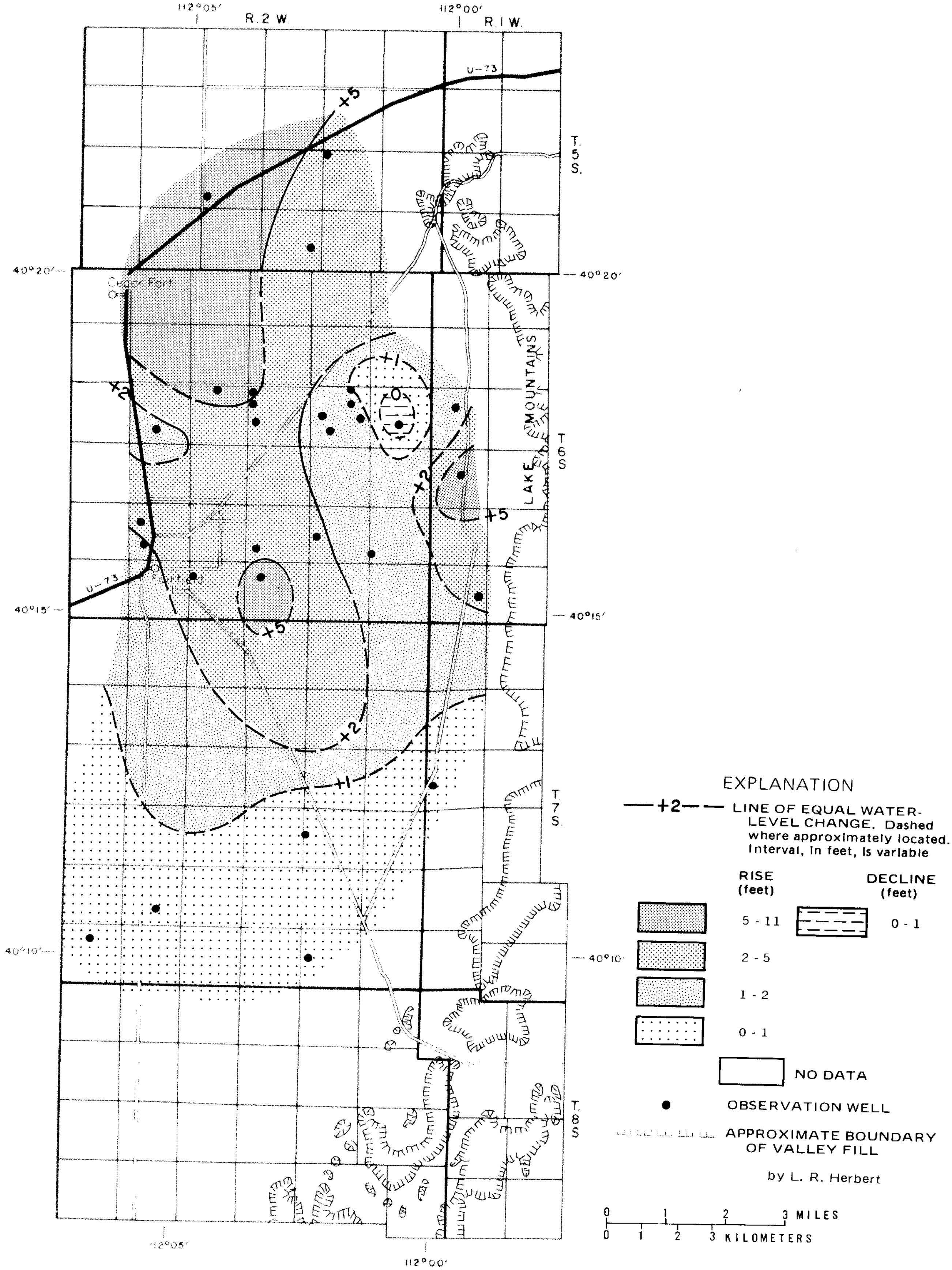

Figure 41.—Map of Cedar Valley showing change of water levels from March 1984 to March 1985.

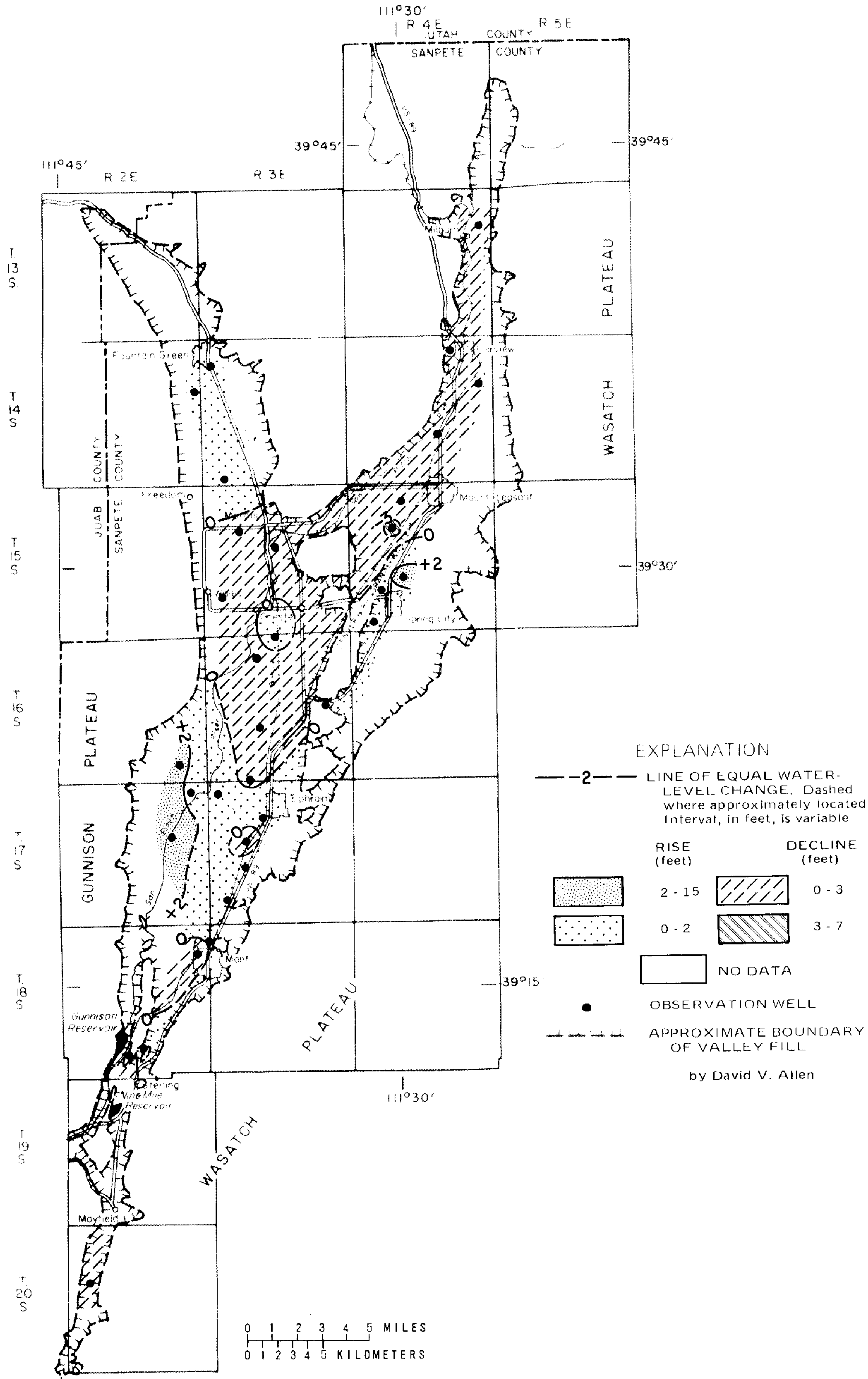

Figure 42.—Map of Sanpete Valley showing change of water levels from March 1984 to March 1985.

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